Office of the Government of CR
Research and Development Council

ANALYSIS OF THE EXISTING STATE OF RESEARCH AND DEVELOPMENT IN THE CZECH REPUBLIC AND A COMPARISON WITH THE SITUATION ABROAD – 2004

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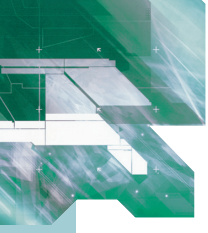


The Preface

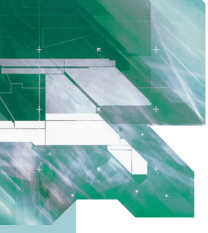
In July 2002, Act No. 130/2002 Coll. on research and development support from public funds and on amendment to certain related acts (Act on research and development support) came into effect that imposed on the Research and Development Council to submit to the Government each year the analyses and evaluations of the existing state of research and development in the Czech Republic and its comparison with the situation abroad. This document represents a second analysis of this kind. The content of the analysis is enlarged against the 2003 Analysis. Newly included were chapters: Competitiveness – evaluation according to the World Economic Forum, Swiss IMD Institute and the European Commission; Implementation of the National Research and Development Policy of CR; and Evaluation of participation of CR in the 6th EU Framework Programme for Research and Development. Left out was the chapter Extraordinary results of research and development. The Government discussed this analysis on December 1, 2004.

Again, the submitted 2004 Analysis testifies on the essential problems of the Czech research and development which are the lack of results available for the benefit of both the economy and society, fragmentation of the public support into too many directions, programmes and projects, and a high average age of the research and development workers. Neither satisfied we can be with the so far results of evaluation of the Czech subjects' participation in the 6th EU Framework Programme for Research and Development.

The remedy of drawbacks will be supported by the new system of the research and development evaluation laying an increased emphasis on the quality and effectiveness of attained results and concept documents prepared by the Czech government. In particular, we can mention the strategy of economic growth and the innovation policy. These documents will contain the sets of measures for the development of a knowledge-based society oriented to the growth of competitiveness and fully using the Czech research and development potential. The measures will be enhanced also by the participation of the Czech Republic in the implementation of the Lisbon strategy and development of the European Research Area.

I believe that any person interested in the research and development in the Czech Republic will find objective information in this publication, in a sufficient detail.

Martin Jahn
Vice-premier of the Government for Economy and
Chairman of the Research and Development Council



Analysis of the existing state of research and development in the Czech Republic and a comparison with the situation abroad – 2004

Act No. 130/2002 Coll. on research and development support from public funds and on amendment to certain related acts (Act on research and development support) in Section 35(2)(b) imposes on the Research and Development Council to produce regular annual analyses and evaluations of the existing state of research and development in the Czech Republic and a comparison with the situation abroad and submit them to the Government.

The first material of this kind was submitted to the Government by the Research and Development Council (hereinafter referred to as the "Council") in November 2003. The Government take cognizance of this analysis by its Resolution No.1167 of November 19, 2003. By the same resolution it imposed on the Council to submit to the Government by June 30, 2004 the proposal of evaluation of research and development and its results which would be based upon the analysis. The evaluation should assist in elimination of main drawbacks of the Czech research and development (hereinafter referred to as the "R&D") discovered by the analysis.

Before taking effect of Act on research and development support the analytical material on R&D – mostly of a shorter extent – were submitted to the Government by the Ministry of Education, Youth and Sports.

As illustrated by several following examples various grounds for R&D evaluation and the R&D evaluation itself are produced also in abroad. Regularly twice a year the Organisation for Economic Co-operation and Development (OECD) publishes extensive sets of R&D indicators of individual member states titled "Main Science and Technology Indicators (MSTI)" and targeted publications on respective areas of research, basic and applied research, etc. MSTI publications are only statistical data sets without any commentaries. For many years the European Commission has been publishing annual reports on basic indicators of research and development in the EU Member States and candidate countries. The scope and level of detail of these reports is growing with the importance of R&D in connection with the European Research Area creation and Lisbon agenda fulfilment. The last report of the European Commission so far "Third European Report on Science & Technology Indicators 2003" has 450 pages of A4 format. The report contains numerous graphs and tables accompanied by detailed commentaries. Detailed analyses of the state of research, development and innovations are published in USA, United Kingdom, Germany, Austria, the Netherlands and other countries. "Science and Engineering Indicators" published each two years by the National Science Foundation (NSF) in the United States belongs among the most extensive.

The presented Analysis of the existing state of research and development in the Czech Republic and a comparison with situation abroad – 2004 (hereinafter referred to as the "2004 R&D Analysis") takes up with the analysis produced last year and uses also information acquired from the similar foreign documents. The 2004 R&D Analysis is broken down into nine component parts:

A. Basic indicators of research and development
B. Analysis of R&D support from public funds
C. Analysis of R&D information system data (R&D IS)
D. Bibliometric analysis of R&D results
E. Patent applications, granted patents
F. Use of venture capital
G. Competitiveness, innovations
H. Implementation of the National Research and Development Policy
I. Evaluation of participation of the Czech Republic in the 6th EU Framework Programme for Research and Development

Graphs or tables, as the case may be, in the respective parts are accompanied by brief commentaries pointing out the important facts and relationships, especially the comparison of the situation in the Czech Republic with the EU-15 average, selected countries of EU-15 and selected countries becoming members in 2004. If data were available for USA and Japan, also these countries were included. The comparisons included following countries: the Czech Republic, Denmark, Finland, France, Japan, Hungary, Germany, the Netherlands, Austria, Greece, Slovakia, Slovenia, United Kingdom and USA. This sample of countries remains the same as in 2003. The names of most of the parts are the same as in the 2003 R&D Analysis. The part "Extraordinary R&D results" was left out in this year's analysis; newly inserted were following parts: Competitiveness, innovations, Implementation of the National R&D Policy, and Evaluation of participation of the Czech Republic in the 6th EU Framework Programme for Research and Development

A. Basic indicators of research and development

20 indicators – A.1.1 to A.4.3

This chapter is divided into four blocks:

- Basic indicators of economic level;
- Human resources for R&D;
- Expenditures on R&D and their structure;
- Structure of R&D funds utilisation.

The economic level is measured by the amount of gross domestic product per one inhabitant, productivity of labour, share of high-tech products in the overall export and employment in high-tech manufacturing and services. In most of the indicators the new EU Member States significantly lag behind the EU-15 countries. The highest level of GDP per head and productivity of labour out of the new Member States is reported by Slovenia, followed in case of GDP by the Czech Republic and in case of productivity by Hungary (A.1.1 to A.1.3). At the same time the figure of Slovenia in both cases is a little bit lower than that of Greece. This confirms that the process of approaching the EU average will be a long and difficult one. Everything depends on how the new Member States, including the Czech Republic, will succeed in increasing the productivity of labour. The basis must be the innovation resulting from the research and development knowledge.

This part is important also for the objective interpretation of data of some other chapters. The R&D expenditures are measured by indicator of their percent in GDP. The equal or similar level of expenditures according to this indicator at marked differences in the GDP amount mean also marked differences in R&D expenditures in monetary units. Yet the R&D efficiency measured e.g. by number of patents, professional publications and their citations per one million inhabitants of a particular country is a routinely used indicator, it is not absolutely objective for countries with significant differences in the amounts of GDP per head. The lagging of new Member States behind the EU-15 average is not so abysmal when taking notice of the GDP per head level, nevertheless alarming.

To a certain extent gratifying for the Czech Republic are the high shares of employment in manufacturing industry (A.1.5) and high-tech services (A.1.6). It seems that the change in the structure of economy would not have to be so complicated as in other new EU Member States and evidently its endangering by shift of manufacturing into countries with lower personal cost would not have to be so strong. Relatively good results are attained by the Czech Republic also in incomes and expenditures of the technology balance of payments (A.1.7 and A.1.8).

As far as the human resources for R&D are concerned the level of all new EU Member States is just about the same; while they are outdoing Greece in the number of R&D employees and research workers, they are still lagging behind the EU average (A.2.1 and A.2.2). The size of both indicators certainly coheres with the real amount of the R&D expenditures. Chapter C depicts the age structures of principal investigators of research projects and research plans (C.4 and C.8). Data on the share of Science&Engineering graduates, as well as information on a very low share of tertiary

education graduates, together with the current age structure of the research base in the Czech Republic (A.2.3 and A.2.4) signal serious problems that must be coped with while exchanging and developing this base.

Next two component parts deal with the structure of R&D expenditures (sources) and structure of their utilisation. Data suggest that most of the countries included in the 2004 R&D Analysis will not meet the target set down on the 2002 spring European Council meeting in Barcelona – to attain by 2010 R&D expenditures in the amount of 3 % of GDP. Today only Finland out of all monitored countries has attained this level (A.3.1). Denmark and Hungary (from low starting values) are experiencing a dynamic growth of expenditures. In other Member States the level of R&D expenditures as measured by percent of GDP stagnates, even falls down in Poland and Slovakia. As already mentioned for objective comparison of the R&D efficiency it is necessary to take into account the actual level of expenditures. These are given in USD per head in current prices and as converted using the Purchasing Power Parity in graph A.3.2. The expenditures of the Czech Republic are less than half the value of the EU-15 average; expenditures of Slovakia reach nearly two thirds of the EU-15 average. In the advanced countries roughly 70 % of the overall R&D expenditures are spent in the private sector; the EU-15 average was 64.4 % in 2002. Out of the new EU Member States this level is approached most by the Czech Republic and Slovakia, but at a very low level of the overall R&D expenditures (A.4.1). The share of R&D expenditures spent in tertiary education institutions is growing in the Czech Republic, but still lagging behind the EU-15 average (A.4.2). While the share of expenditures spent in the Czech governmental R&D sector (institutions of the Academy of Sciences of CR and departmental research institutions) moderately goes down (23.3 % in 2003), it is higher than the EU-15 average (13 % in 2002), but lower than in all other monitored new EU Member States (A.4.3).

B. Analysis of R&D support from public funds

4 indicators – B.1 to B.4

In this part the R&D expenditures from public funds in the Czech Republic are evaluated in a greater detail. The fact is that still we are not able to achieve the target repeatedly announced by the Government - public R&D expenditures in the level of 0.7 % of GDP. Over the last four years (2001–2004) the expenditures are or will be less than 0.6 % of GDP (B.1). But on the other hand it must be put that expenditures in monetary units grow, with the exception of 2002, by more than 5 % annually, which is more than in many of the OECD member countries. Other graphs in this part depict the trend of overall expenditures with the largest providers in the Czech Republic and expenditures on the institutional and targeted support to R&D.

The graphs confirm that there occurs an undesirable concentration of expenditures into fewer numbers of budgetary chapters (providers) in the Czech Republic. The expenditures of the Ministry of Education, Youth and Sports and Academy of Sciences of CR experience a quick growth. With other selected providers the increase in expenditures is a little bit slower. In the Czech Republic the targeted support of research and development moderately prevails over the institutional support that is by virtue of approved research plans granted to the institutes of the Academy of Sciences of CR, universities, departmental research institutes and selected organisations of non-profit character.

C. Analysis of R&D information system data (R&D IS)

10 indicators – C.1 to C.10

This part is based upon data bases administered and operated by the Research and Development Council. Evaluated are numbers of R&D projects and amounts of R&D expenditures by sectors between 2001 and 2003, numbers of R&D projects by amounts of targeted support (size of projects) and the age structure of principal project investigators. This is made also for the institutional support on the basis of research plans. Two graphs analyse the results registered in R&D IS by their types.

The highest number of projects is in the field of technical sciences and engineering, followed by social sciences and medicine. More than double the volume of funds than on projects in medicine is spent on projects in the field of technical sciences and engineering. The targeted support is still fragmented into a large number of rather small projects; absolutely prevailing are projects with annual support lower than CZK 1 million.

There occurred no marked changes in the institutional support of research plans in the monitored period. The largest support was granted to plans in medicine, physics and biology. Only in these fields the annual support exceeded CZK 20 million per one research plan.

Alarming and concrete measures requiring matter is evidently the high average age of principal investigators of R&D projects and research plans (C.4 and C.8). There occurred a moderate improvement in the R&D projects by announcement of several programmes supporting projects of younger research workers (up to 35, or 40 years respectively).

The graphs C.9 and C.10 deal with evaluation of R&D results acquired in projects and research plans supported from public funds. The professional publications are strongly dominating. Numbers of patents, prototypes and verified technologies are extraordinarily low. Moreover, an important portion of R&D results is published in publications not included in the internationally recognised evaluations. The benefits of the Czech research and development to economy and society are inadequate. The necessary improvement should be assisted by a new system of evaluation of research and development and its results that is being prepared by the Research and Development Council in co-operation with the Ministry of Education, Youth and Sports in line with a task imposed by the Government upon discussing the 2003 R&D Analysis. According to its policy statement the Government will put emphasis on strengthening and concretization of the co-operation between universities, Academy of Sciences of CR, departmental institutions and corporate sphere, particularly industry. With that aim in mind the composition of the Research and Development Council was changed accordingly.

D. Bibliometric analysis of R&D results

6 indicators – D.1 to D.3.4

This part is based upon data of the internationally recognised firm ISI Thomson, Philadelphia, USA. The firm monitors the numbers of articles and numbers of citations of these articles in more than eight thousand professional periodicals all over the world. The material portion of the Czech research results is published in periodicals not monitored (nonimpacted) by ISI Thomson.

In the relative numbers of publications the Czech Republic arrives at a level being a little bit higher than half the value of the EU-15 average (D.1) and with the exception of Slovenia it is better than other monitored new EU Member States (Hungary, Poland, Slovakia). When taking into account the actual amount of R&D expenditures in the Czech Republic (see A.3.2) in USD per head, where the EU-15 average expenditures are more than double the value in the Czech Republic, this situation can be marked as a relatively good one. As far as the number of publications is concerned, at respecting the R&D expenditures the efficiency of the Czech Republic measured by the number of publications is a little bit higher than the EU-15 average. Somewhat worse situation is in the level of publications measured by numbers of their citations. Here the Czech Republic attains a level only a little bit higher than one third of the EU-15 average (D.2). It lags behind the EU-15 average even when respecting the amount of R&D expenditures. It is gratifying that each year since 1994 the relative citation index of the Czech Republic, which compares the citation rate of Czech publications with the worldwide average, has been growing. Since 1994 the citation rate of Czech publications has increased from less than half of the world data base average to nearly three quarters of the world data base citation rate in 2003 (D.3.2).

Other graphs compare the relative citation indexes of selected countries and EU-15 as a whole in 24 disciplines between 1993 and 2003 (D.3.3). In the Czech Republic only mathematics is above the world data base average. Very close to the world data base average level in the Czech Republic are engineering, clinical medicine and material sciences. Eight disciplines do not reach even

50 % of the world data base average. On the contrary, e.g. Hungary has five disciplines above the world data base average and no discipline has the relative citation index lower than 50 % of the world data base average. The performance of Denmark (19 disciplines above the world data base average), the Netherlands (18 disciplines) and Finland (10 disciplines) holds out hopes that even small, non-English speaking countries can accomplish excellent results. It is necessary, however, to mention that research workers of these countries were never restricted in their contacts with the world science like the research workers of the Czech Republic and other countries of the Eastern block. The establishment in the impact periodicals does not take place by leaps and bounds, but it is relatively very slowly.

The sets of diagrams D.3.4 depict the trend of the relative citation index and number of publications in the years between 1994 and 2003 for 24 disciplines in the Czech Republic. The growth in the citation rate and number of publications in many disciplines is gratifying. Again the solid level of mathematics, clinical medicine and material sciences was proved.

E. Patent applications, granted patents

8 indicators – E.1to E.8

This part evaluates the invention applications and granted patents in the Czech Republic, patent applications and granted patents at the European Patent Office (EPO) and U.S. Patent and Trademark Office (USPTO). Given are mostly numbers per one million inhabitants of a particular country. Although the indicators of relative numbers of applications and granted patents are not an absolutely clear and objective measure of the research and development quality, these indicators are routinely applied for evaluation of the successiveness of national R&D and innovation policies. The inventions and related patent applications are produced of course also outside the research. But even at respecting the above facts the R&D efficiency in the Czech Republic from the view of invention applications and granted patents numbers may be marked as inadequate. The relative numbers of applications and granted patents with EPO and USPTO are at least by one order lower than in other evaluated EU-15 Member States. A certain comfort may be that with the exception of Slovenia the situation is identical also in other evaluated new EU Member States. A moderate advantage of Hungary over the Czech Republic cannot be overestimated at the absolutely low numbers of both applications and granted patents.

It can be expected that the necessary improvement will be supported on one hand by the possibility to include the patenting cost into eligible R&D expenditures permitted by Act No. 130/2002 Coll. on research and development support from public funds and on the other hand by a prepared new system of evaluation of research and development and its results together with a pressure on more close cooperation between the research and development and business sphere.

F. Use of venture capital

2 indicators – F.1 to F.2

This part of 2004 R&D Analysis evaluates in two tables with commentaries the use of venture capital for establishment and early development of new enterprises and for expansion of enterprises already existing. It appears in numerous foreign analytical documents that one of the main barriers to quick and effective transmission of R&D knowledge into new products, technologies and services is the lack of capital for establishment of new enterprises and expansion of the existing ones. These documents do not regard the commercial banks‘ loans and stock markets to be suitable for this type of financing; while venture capital funds and rich private investors – the so called “business angels” – are regarded to be suitable. The analytical documents of the European Commission routinely contain information on trends in the venture capital expenditures.

The annual venture capital expenditures in evaluated countries – the seed and start up money – exceeded the level of 0.1 % of GDP only exceptionally (USA, Finland and the United Kingdom). In the Czech Republic and other monitored new Member States these expenditures did not exceed 0.03 % of GDP.

The use of venture capital for expansion of enterprises is clearly higher. Between 1998 and 2002 in no evaluated country, neither in USA, this part of expenditures exceeded 1 % of GDP (USA 0.784 % in 2000, EU-15 average 0.295 % in 2001). In 2001, or 2002 respectively, most of the monitored countries experienced a decrease in this use of venture capital in connection with the "new economy crisis". In the monitored new EU Members States the highest expenditures for expansion of existing enterprises were spent in the Czech Republic in 2000 – 0.176 % of GDP.

In context of the Lisbon agenda the EU bodies intensively deal with the issue of increasing the participation of the venture capital sources in transferring the R&D results into life.

G. Competitiveness, innovations

3 documents on competitiveness evaluation – G.1 to G.3

This is a new part replacing the chapter "Extraordinary R&D results" being part of the 2003 R&D Analysis. Three component parts briefly characterise results of three important documents dealing with the competitiveness evaluation:

- Competitiveness according to the Global Competitiveness Report – for the World Economic Forum;
- Competitiveness according to the World Competitiveness Yearbook 2004 of the Swiss Institute for Management Development (IMD);
- European Innovation Scoreboard 2003 published by the European Commission.

First two documents give the ranking of countries according to their competitiveness. Methodological differences, not too principal, are characterised in the respective part of the 2004 R&D Analysis. Third document prepared by the European Commission does not give the ranking of countries, but values of 28 quantitative indicators for the EU Member States and candidate countries. The indicators are divided into four groups:

- Human resources;
- Creation of knowledge;
- Transmission and application of knowledge;
- Innovation: finance, outputs and markets.

In the evaluation according to the first two documents the rankings of the monitored new EU Member States move in individual years around the dividing line between the third and fourth tens of countries, Poland and Slovakia mostly in the fifth tens of countries. In the evaluation for the World Economic Forum the best place out of the new Member States is taken by Slovenia (31st place in 2003), followed by Hungary (33rd place) and the Czech Republic (39th place). In the last 2004 evaluation according to the Swiss IMD institute Slovakia was the best one of these countries (40th place), followed by Hungary (41st place) and the Czech Republic (43rd place).

The European Innovation Scoreboard 2003 does not give the ranking of countries; its aim is to search for well-tested approaches and their dissemination within the so called method of open coordination. The scoreboard gives the values of 28 indicators and their development trends. It clearly follows from the tables that the new Member States markedly lag behind the EU-15 average; in many indicators they reach, however, the level of Greece and Portugal, or even outperform them. Therefore the process of accomplishing the EU average values will not be any simple or short-time.

H. Implementation of the National Research and Development Policy

The National Research and Development Policy of the Czech Republic for 2004–2008 was approved by the Government in its Resolution No.5 of January 7, 2004. In this part the 2004 R&D Analysis gives brief information on the policy implementation in the first year of its effect. This part mentions information on the preparation and introduction of the new system of evaluation of research and development and its results. Hopes are placed into this system that it could contribute to a substantial increase in the efficiency and effectiveness of research and development in the

Czech Republic. Moreover, it gives information on the process of implementation of the National Research Programme I, development of the National Research Programme II, and on preparation of act on public research institutions. It contains also information on the preparation of the National Innovation Policy. Tasks having been imposed in connection with the new National Research and Development Policy are being fulfilled.

I. Evaluation of participation of the Czech Republic in the Sixth EU Framework Programme for Research and Development

10 indicators – I.1 to I.10

This part deals with evaluation of activities of the EU-25 Member States in the Sixth EU Frame-work Programme for Research and Development (6FP) by means of three parameters. Evaluated are:

• response – number of teams of a particular country in draft projects submitted to the European Commission for inclusion into 6FP per 1 million inhabitants of that country;

• participation – number of teams of a particular country in projects included into 6FP per 1 million inhabitants of that country;

• rate of success – rate of participation and response in per cent; but with response and participation being expressed in absolute numbers of projects.

Evaluated are both activities in the 6FP as a whole and in its individual thematic priorities. Basic information on 6FP are given in Appendix I.1 to this part.

In the overall response the Czech Republic is in 6th place among the new Member States and lags behind the EU-25 average. The same situation is with participation. In the overall rate of success the Czech Republic is in 5th place among the new Member States, only the lagging behind the EU-25 average is more significant. The following table compares the rates of success between seven 6FP thematic priorities.

Rate of success in individual 6FP thematic priorities

	Priority	Ranking of CR among the new Member States	First place out of EU-25	First place out of new Member States
N.	Name			
1	Life sciences, genomics and biotechnology for health	3.	Belgium	Estonia
2	Information society technologies	5.	France	Malta
3	Nanotechnology, nanosciences, multifunctional materials, new production processes	7.	Luxembourg	Estonia
4	Aeronautics and space	8.	Cyprus	Cyprus
5	Food quality and safety	10.	Estonia	Estonia
6	Sustainable development – global changes and ecosystems	2.	Germany	Lithuania
7	Citizens and governance in a knowledge-based society	4.	Malta	Malta

No premature conclusions should be drawn out from these data. At very small number of draft projects and at acceptance of some of them the rate of success is extraordinarily high being the example of Malta in the 2nd priority “Information society technologies”. The second reason for more careful interpretation is that these results are only preliminary as to April 15, 2004 and that marked changes in the continued course of 6FP can be expected.

No satisfaction can be expressed over the response, participation or rate of success of the Czech Republic. Causes may be of all kinds: lack of resources and time of Czech subjects necessary for demanding preparation of good draft projects, insufficient contacts with foreign partners or inadequate knowledge of 6FP methodology. Neither the relative saturation of the Czech subjects with financial means and disinterest in the international cooperation supported from the EU resources can be excluded. The analysis of causes will be dealt with within the development of the 2005 R&D Analysis.

A. Basic indicators of research and development

This part of the analysis compares the basic indicators of research and development (R & D) that are periodically ascertained by national bureaus of statistics in accordance with the internationally renowned "Frascati Manual"[1] on measurement and evaluation of scientific and technological activities prepared by the Organisation for Economic Co-operation and Development (OECD) as a handbook for standardization of statistical indicators of research and development at international level. On regular basis the renowned international organisations (Eurostat, OECD) collect these data which are further compiled into the internationally comparable indicators. Twice a year OECD publishes "Main Science and Technology Indicators (MSTI)" being the main source of data for this chapter.[2]

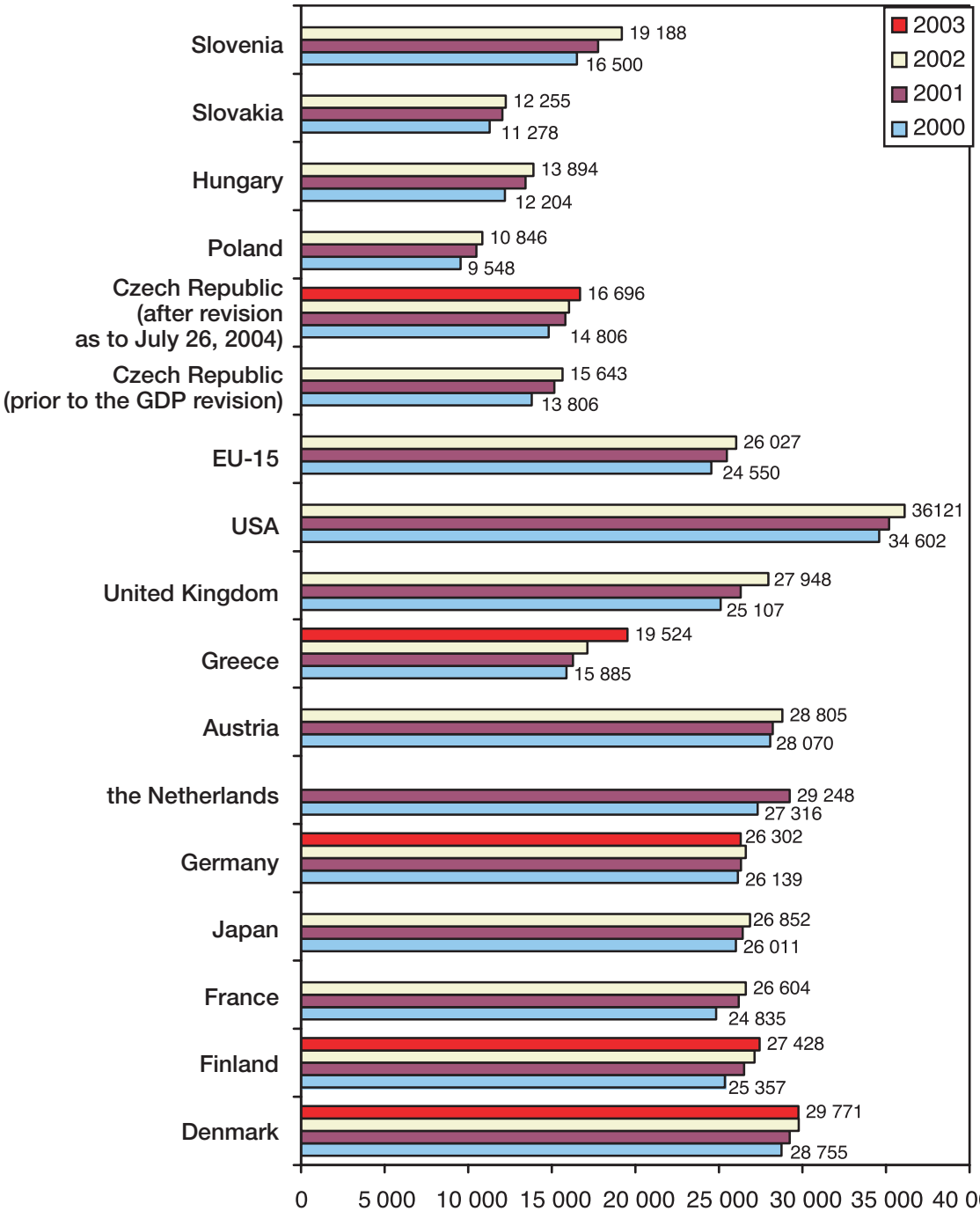
When selecting the suitable indicators the contents of publications of the European Commission on the results of benchmarking the research and innovation policies of the EU Member States and candidate countries[3] have been taken into account. Certain special-purpose publications of the European Commission and Eurostat, particularly the sets of structural indicators for regular spring meetings of the European Council, were used as well.

The structure of Section A is similar to that of the R & D analysis approved by the Government in November 2003[4]. The indicators are broken down to four main groups:

- Basic indicators determining the economic level of a particular country, or the impact of R & D on this level respectively (GDP per head; foreign trade in advanced products, technologies and services; employment in the industry and services with advanced technologies) – 8 graphs in total
- Human resources for R & D – 4 graphs in total
- Expenditures on R & D and their structure – 5 graphs in total
- Structure of the R&D funds utilisation in three main sectors: private, state (governmental) and universities – 3 graphs in total

1 Frascati Manual 2002, OECD, Paris 2002 - www.oecd.org, Czech translation provided by the Research and Development Council
2 MSTI: 2004/1 edition, OECD, Paris 2004 – www.oecd.org
3 Among others the publication "Benchmarking National Research Policies, 2002", ISBN 92-894-4568-8.
4 Resolution of the Government of CR No.1167 of November 19, 2003.

A.1.1 GDP per head (USD per head; current prices, PPP)



Source: OECD MSTI 2004/1 and CSO

Note: In 2004, the Czech Statistical Office completed an extraordinary revision of the time line (1995–2002) of national accounts indicators in current prices guaranteeing the full harmonisation with the applicable standards defined by the European System of Accounts (ESA 95) and related regulations of the EU institutions; it is applied to all data using GDP

Link: http://www.czso.cz/csu/edicniplan.nsf/p/50n1-04

Commentary:

(1) The share of gross domestic product (GDP) per head is generally considered to be the basic indicator of the economic level or development of a particular country. The GDP increment is a carefully monitored parameter of economic policies of all countries and integration groupings.

(2) In August 2004 CSO published the results of an extraordinary revision of GDP in the Czech Republic for the years 1995–2002 (see the note to Graph A.1.1). After the revision GDP per head is ca by 5 to 8 % higher in the respective years than the previous values.

(3) GDP per head values are given in current prices in USD per head and as converted using the Purchasing Power Parity (PPP). The conversion of national currencies to USD at official rates is not absolutely correct and realistic. The conversion at PPP allows for expressing the different levels of prices (life cost) in each country. In stable economies the changes in the purchasing power parity of national currencies are very small.

	2000	2001	2002	2003
Rate of exchange (CZK/USD)	38,59	38,04	32,74	28,23
PPP (CZK/USD) according to OECD[5]	14,14	14,32	14,77	14,78

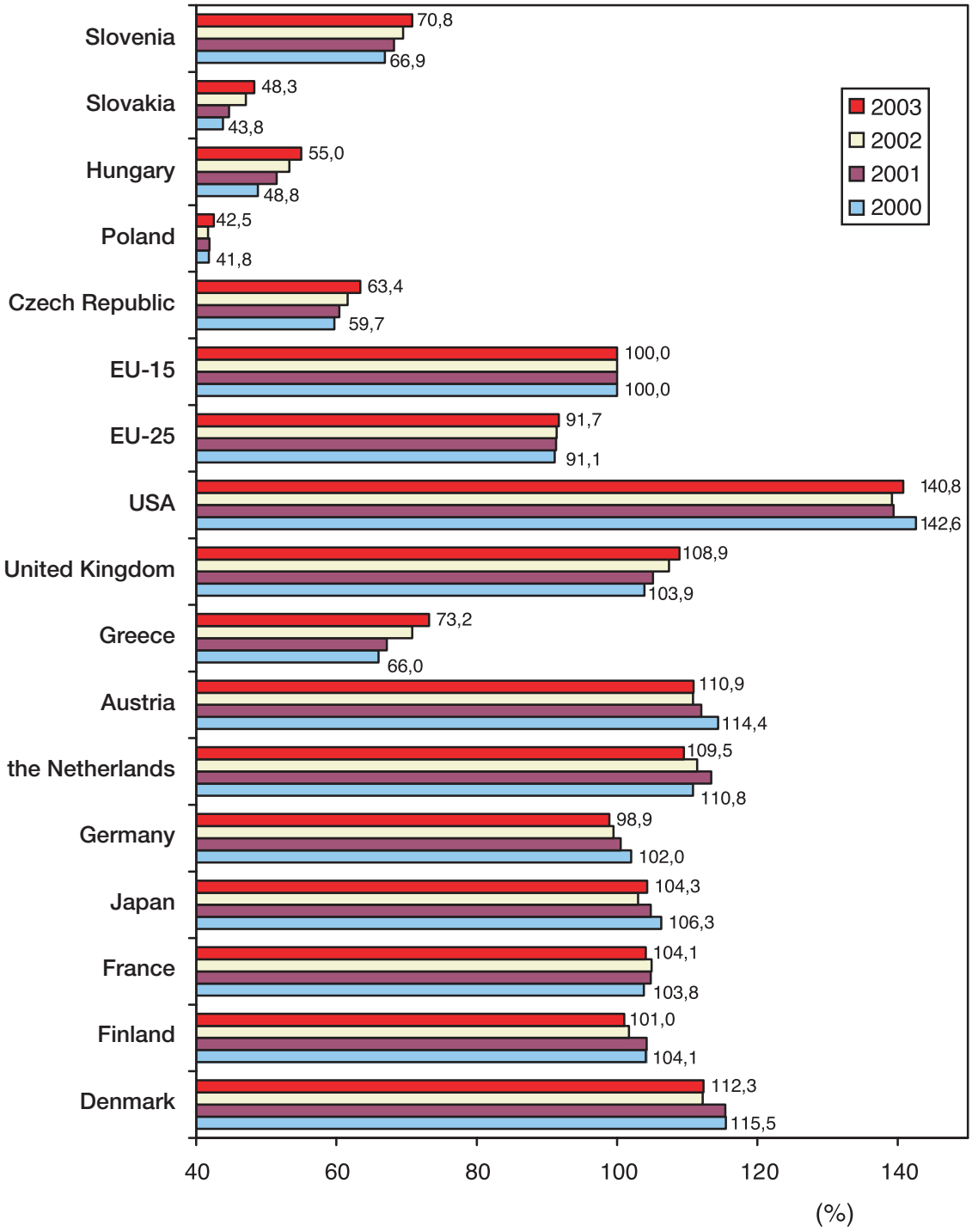
(4) The highest value of GDP per head out of the monitored countries is reported by USA – more than USD 36 000 per head in 2002; among the European countries by Denmark – USD 29 800 per head in 2002 and 2003 and Austria – USD 28 800 per head in 2002.

(5) Out of the monitored new EU Member States, the highest GDP value is reported by Slovenia (USD 19 188 per head in 2002) outdoing even Greece (USD 17 129 per head in 2002). Then follows the Czech Republic (USD 15 643 per head in 2002, or USD 16 032 per head in 2002 and USD 16 981 per head in 2003 after conversion to the revised GDP respectively).

(6) The following Graph A.1.2 compares the development of the GDP per head value in proportion to the average GDP per head values for EU-15.

5 Purchasing Power Parities for OECD Countries 1980–2004;OECD, July 9, 2004

A.1.2 Proportional GDP per head value in PPP (EU-15 = 100 %)



Source: Eurostat 2004

Notes to methodology:

- Values for 2003 are only preliminary for all countries.
- Values for CR are the values according to Eurostat not taking into account the revision made by CSO in July 2004.

Commentary:

(1) The graph gives also average values for the set of 25 EU Member States, i.e. including the candidate countries acceded in 2004. Even at a relatively low increase in the number of the EU-25 inhabitants (the only larger country is Poland) the average GDP per head fell in comparison with EU-15 nearly by 10 %.

(2) The above average values of GDP per head are reported by Denmark, Austria, the Netherlands, Finland and the United Kingdom. Throughout the whole monitored period the GDP per head value in USA is by more than 40 % higher than the EU-15 average. In Germany, this value moves around the EU-15 average in the monitored period, with increments being lower than increments of the EU-15 average.

(3) The below average values of GDP per head among the monitored countries are reported by all new EU Member States and Greece.

(4) The most rapidly growing is the GDP per head value in Greece and in the monitored new EU Member States (in Hungary and Slovakia). Out of the monitored traditional EU countries, GDP per head grows more rapidly than the EU-15 average only in the United Kingdom (from 103.9 % in 2000 to 108.9 % in 2003), in other countries it stagnates or increases only a slightly slower than the EU-15 average. The same applies to the development in Japan.

(5) The facts mentioned in the graph must be taken into account also for all other indicators expressed as GDP shares (e.g. R & D expenditures) and indicators related thereof (e.g. numbers of research workers).

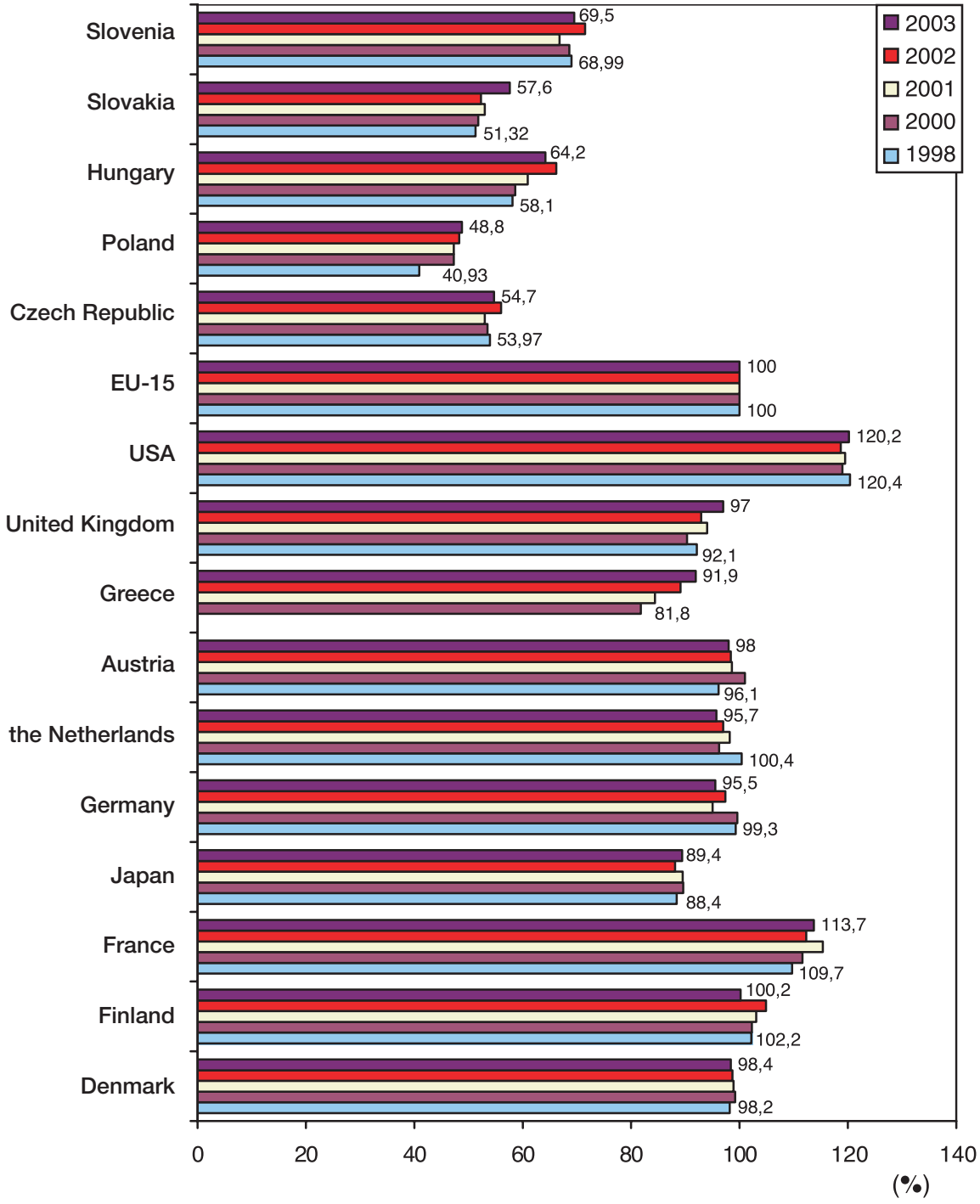
(6) OECD makes comparisons of the GDP per head levels with that of USA. The following table gives data for 2002.

	Czech Republic	Denmark	Finland	EU-15	France	Japan	Hungary	Germany	The Netherlands	Poland	Austria	Greece	Slovakia	UK	USA
GDP per head (in % of GDP per head in USA)	44	83	75	73	77	74	40	75	82	29	80	49	36	74	100

Source: GDP from OECD National Accounts, May 2004

In 2002 the values of GDP per head in the monitored new EU Member States and in Greece were lower than in USA. The highest value of GDP per head in comparison with the US value is reported by Denmark (83 %), the Netherlands (82 %) and Austria (80 %). The mentioned OECD information source indicates that the highest GDP per head value of all OECD countries is reported by Luxembourg (141 %) and Norway (102 %).

A.1.3 Overall productivity of labour (GDP per number of workers as share of the overall EU-15 productivity = 100 %)



Source: Eurostat 2004

Commentary:

(1) The productivity of labour expressed as amount of GDP per 1 employee (hereinafter referred to as "worker") or hour of work is another frequently used indicator of the economic performance. It is expressed either by annual increments in per cents or as a percentage of a particular country's productivity to the productivity of a compared country or integration grouping. The Graph A.1.3 depicts the overall productivities of the monitored countries as a percentage to the overall productivity of EU as a whole. The 2003 figures are estimates.

(2) The United States experience the highest level of the overall productivity; they basically keep their distance of roughly twenty percentage points ahead of EU throughout the whole evaluated period. There occur no marked changes in the monitored EU Member States against the level of EU as a whole. The annual productivity growth is reported only by Greece, with the exception of a decline in 2003 against 2002, and Hungary.

(3) The overall productivity in the new Member States is substantially lower than in EU-15. The highest productivity is attained by Slovenia – around 70 % of the EU overall productivity. Slovakia recorded a significant growth in the productivity in 2003 against 2002 (from 52.3 % in 2002 to 57.6 % in 2003).

(4) Differences in the productivity per one worker and per one hour worked expressed as a percentage of the productivity level in USA are given in the following table.

Relative productivity in 2002 (% of productivity in USA)

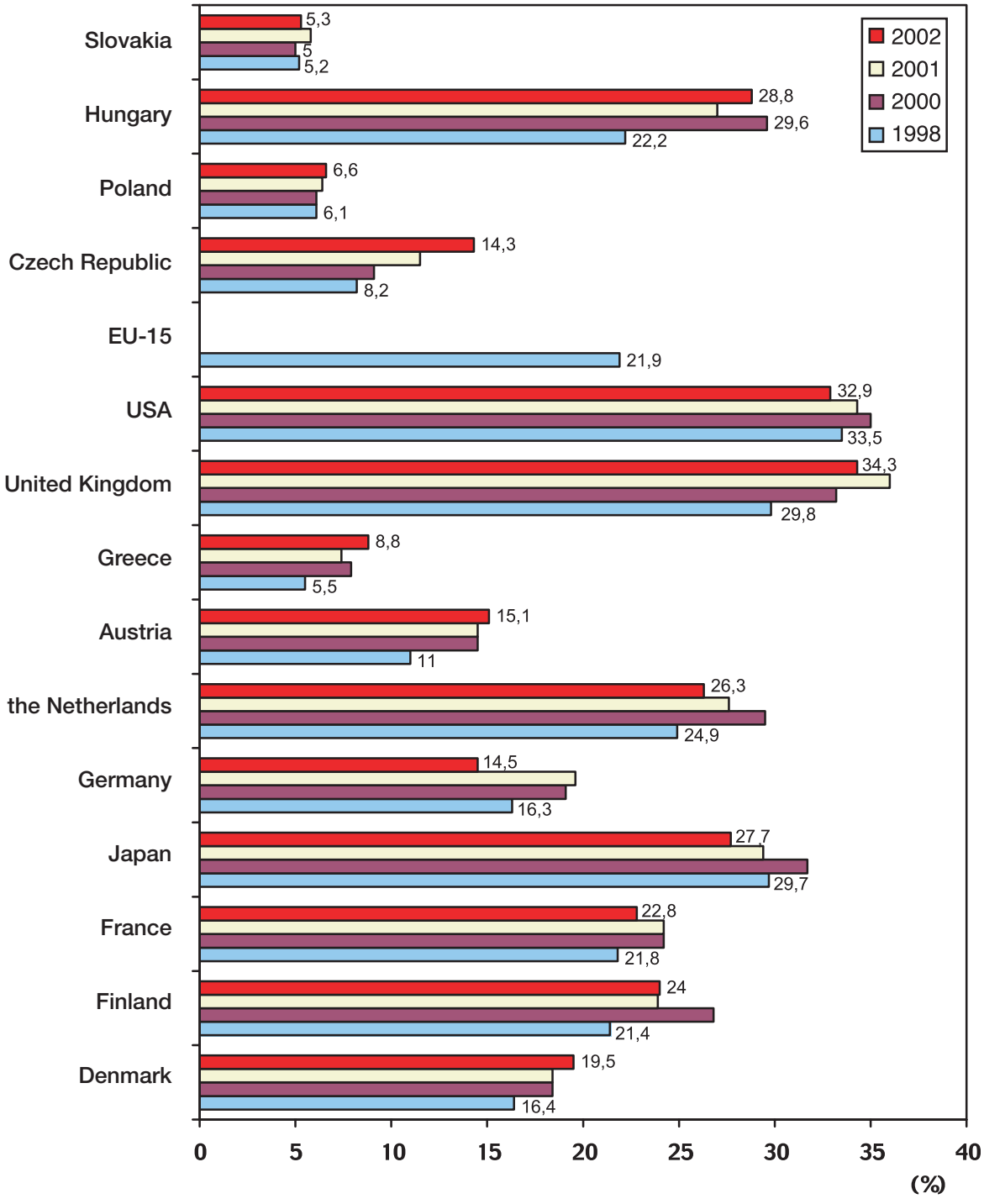
	GDP per hour worked	GDP per worker
USA	100	100
Czech Republic	41	44
Denmark	95	78
EU-15	91	80
Finland	84	78
France	103	88
Japan	72	72
Germany	101	80
Hungary	51	50
The Netherlands	106	78
Poland	—	39
Austria	98	81
Greece	59	63
Slovakia	39	43
United Kingdom	79	74

Source: OECD Science, Technology and Industry Outlook 2003

All monitored EU-15 Member States – with the exception of Greece – report higher relative values of the productivity per one hour worked than per one worker. The EU-15 Member States with their "generous" social policy (less working hours per week, higher shares of workers with shorter working hours) attain higher level of labour productivity per one worked hour than the United States (the Netherlands 106 % of the US level; France 103 %; Germany 101 %). It follows from the OECD paper that the highest productivity per one hour worked of all was attained in 2002 by Norway, 131 % of the US level.

On the other hand, in the Czech Republic and Slovakia the productivity per one hour worked in comparison with USA is lower than the productivity per one worker. In Hungary both levels of productivity in comparison with USA have nearly the same value (51 % and 50 %).

A.1.4 Percentage of the high-tech products export of the total export (in per cent)



Source: OECD MSTI 2004/1
Note: The source does not mention data for Slovenia.

Commentary:

(1) According to the United Nations international classification of economic activities ISIC[6] Rev. 3 the activities (hereinafter referred to as industries) producing high-tech products include the aircraft industry (ISIC and OKEČ 353), electronic industry (manufacture of radio, television and communication equipment and apparatuses – ISIC and OKEČ 32), manufacture of office technology and computers (ISIC and OKEČ 30), pharmaceutical industry (ISIC 2423, OKEČ 244) and manufacture of instruments and apparatuses (medical, precision, optical and time-measuring – ISIC and OKEČ 33).

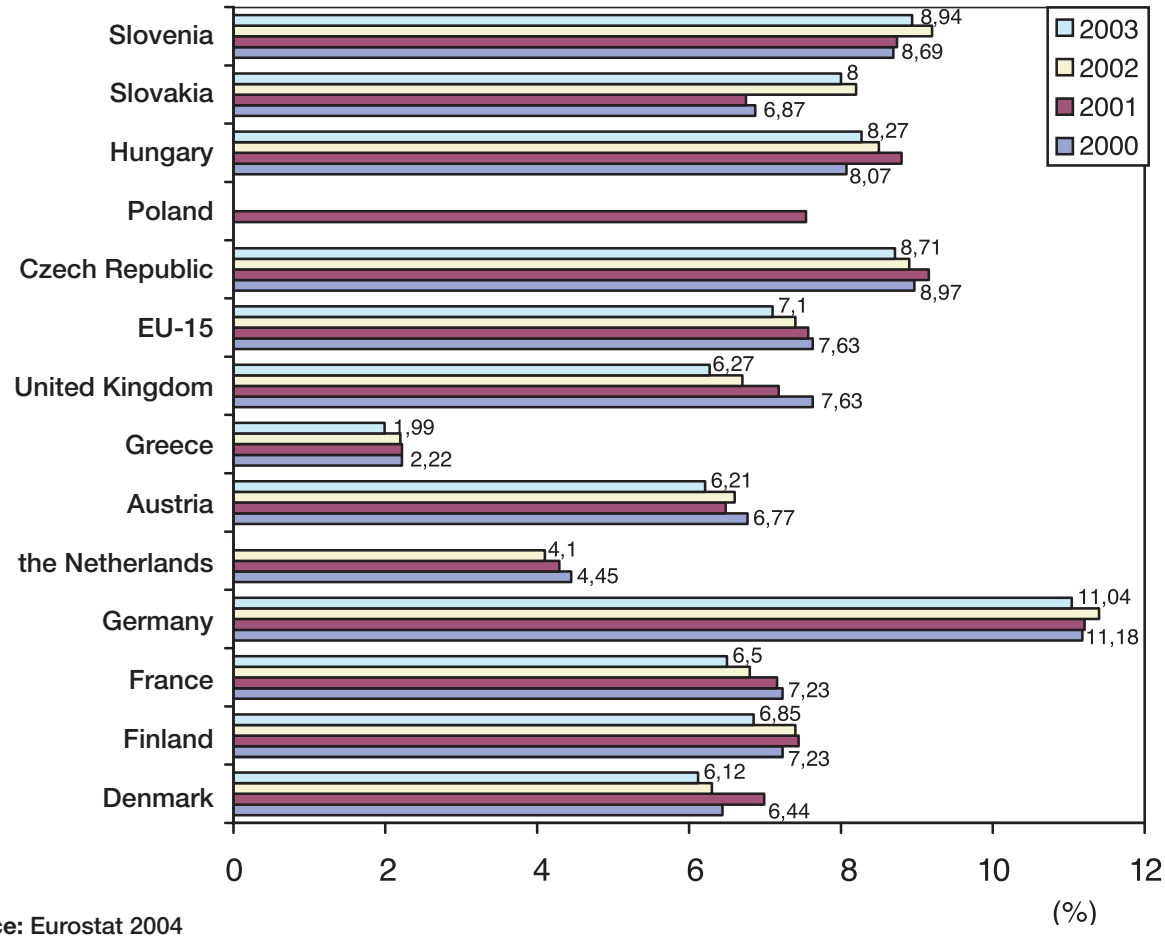
(2) The percentage of export of the high-tech industries category in the Czech Republic is growing in a gratifying manner, however still significantly lagging behind the value of this indicator in most of the compared Member States of EU, as well as of EU as a whole. It is higher than in Greece and approaching Germany and Austria.

(3) High figures are reached by high-tech exports in Hungary in all years of the evaluated period; the causes being evidently the right structural orientation of direct foreign investments in this country. The percentage of high-tech exports in Poland and Slovakia basically stagnates on low figures between 5 and 6 per cent.

(4) This indicator reaches the highest figures – over 30 per cent – in large countries with high industrial development: in the United States, Japan, and United Kingdom.

6 ISIC – International Standard Industrial Classification. The Czech Republic uses for classification of all types of economic activities the Industrial Classification of Economic Activities (Odvětvová klasifikace ekonomických činností – OKEČ) that is compatible both with ISIC and the European standard NACE (Nomenclature générale des activités économiques dans les Communautés européennes) binding for all EU Member States.

A.1.5 Employment in manufacturing industries with medium-high to high-tech technologies (in per cent of overall employment)



Source: Eurostat 2004

Commentary:

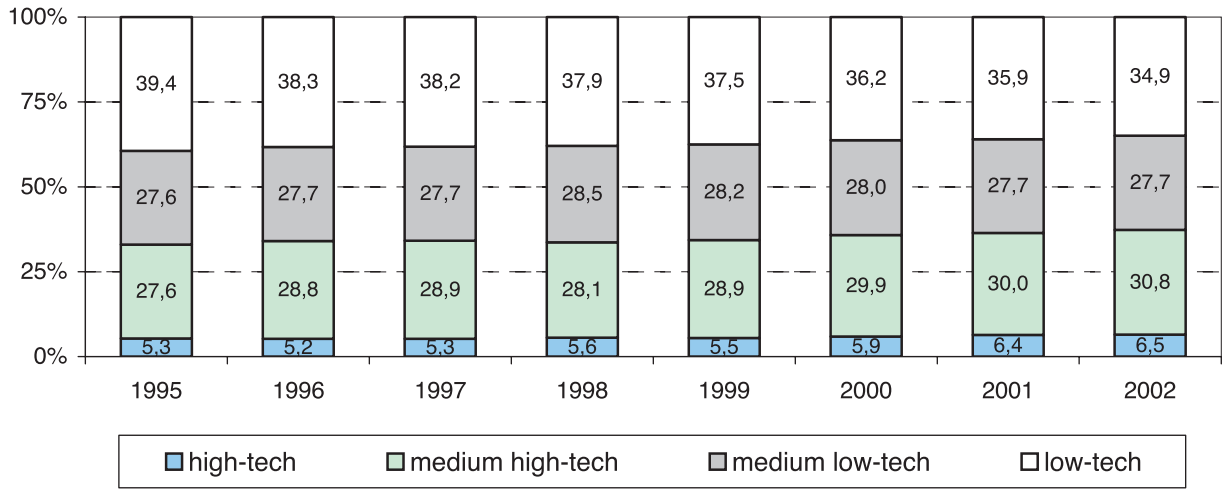
(1) The shares of employment in the manufacturing industries with medium-high to high-tech technologies[7] in the Czech Republic and new EU Member States are higher than is the average in EU-15 and, with the exception of Germany, higher than in other monitored countries of EU-15. The value for the United States is not given; the United States use different classification of manufacturing sectors.

7 It covers following groups of economic activity branches according to ISIC, or OKEČ respectively: Manufacture of chemicals, preparations, medicaments and chemical fibres – 24; Manufacture and repairs of machinery and equipment not elsewhere classified – 29; Manufacture of office, accounting and computing machinery – 30; Manufacture of electrical machinery and apparatus not elsewhere classified – 31; Manufacture of radio, television and communication equipment and apparatus – 32; Manufacture of medical, precision and optical instruments, watches and clocks – 33; Manufacture of motor vehicles (with the exception of motorcycles), trailers and semi-trailers – 34; and Manufacture of other transport equipment – 35.

(2) This indicator is based upon a legitimate belief that research and development must lead to introduction of new competitive technologies and products showing itself in the growth of employment in the manufacturing industries with medium-high to high-tech technologies.

(3) The Czech Statistical Office monitors the structure of employees by technological groups of manufacturing industries according to their demands on research and development[8]. The following table shows the development of this structure between 1995 and 2002 in per cents of the overall employment within the Czech manufacturing industries.

The structure of employees by technological groups of manufacturing industries between 1995 and 2002 (%)

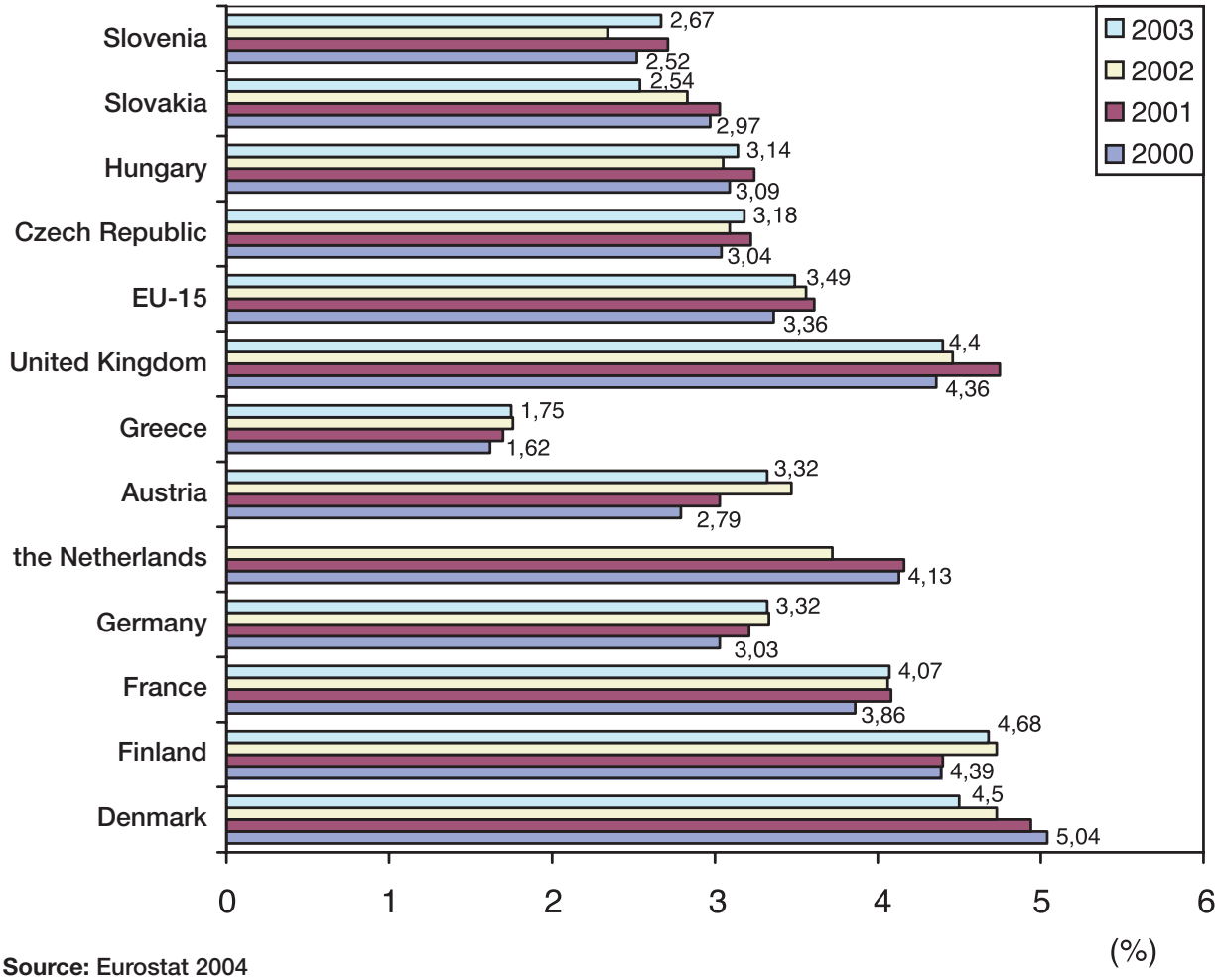


Source: CSO, structural surveys P 4-01 and P 5-01 (high-tech + medium high-tech = manufacturing industries with medium-high to high-tech technologies – see the Graph A.1.5)

The share of employees in medium-high to high-tech industries grew from 32.9 % in 1995 to 37.3 % in 2002. The employment growth in these industries took place basically to the detriment of employment in the low-tech industries.

8 High technology research and development-intensive industries or group of manufacturing industries with high technological demands (hereinafter referred to as high-tech): OKEČ 244, 30, 32, 33, and 353. Advanced technology research and development-intensive industries or group of manufacturing industries with medium-high technological demands (hereinafter referred to as medium high-tech): OKEČ 24 excl. 244, 29, 31, 34, 352, 354, and 355. Medium-low technology industries with lower research and development demands or group of manufacturing industries with medium-low technological demands (hereinafter referred to as medium low-tech): OKEČ 23, 25 to 28, and 351. Low technology industries with lower research and development demands or group of manufacturing industries with low technological demands (hereinafter referred to as low-tech): OKEČ 15 to 22, 36 and 37. For names of individual OKEČ see: http//www.czso.cz/csu/redakce.nsf/i/odvetvova_klasifikace_ekonomickych_cinnosti_(okec)

A.1.6 Employment in high-tech services (in per cent of overall employment)



Source: Eurostat 2004

Commentary:

(1) The importance of services is rising, particularly in the OECD countries. The OECD publication titled "Science, Technology and Industry Scoreboard" mentions that nearly 70 % of the overall GDP in 2000 was generated in services. The development of services has been supported also by the fact that many manufacturing enterprises are getting rid of certain activities and purchase them as services (outsourcing).

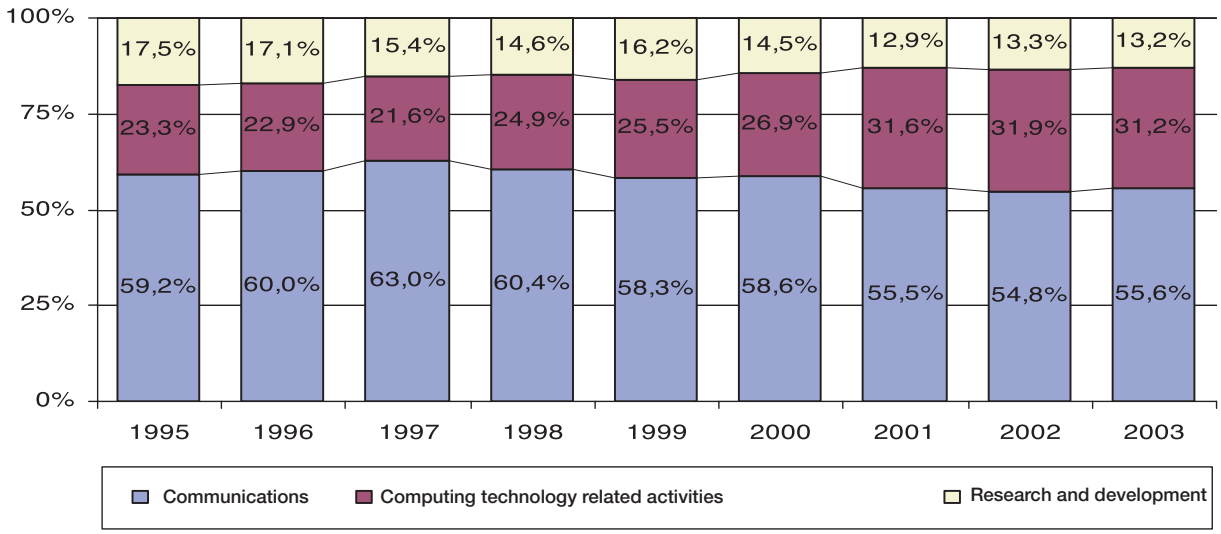
(2) The high-tech services include services in the area of post and telecommunications (ISIC and OKEČ 64), information technologies, including software development (ISIC and OKEČ 72) and R & D services (ISIC and OKEČ 74); i.e. in branches using telecommunication technologies, computing technology, scientific and other complex apparatuses, etc. in a large extent.

(3) Like the previous indicator of employment in the manufacturing industries with medium-high to high-tech technologies, this indicator reaches high values in Finland (4.68 % in 2003), Denmark (4.50 % in 2003) and United Kingdom (4.4 % in 2003).

(4) Out of the new EU Member States, the Czech Republic (3.18 % in 2003) and Hungary (3.14 %) approach by their level of employment in high-tech services the EU-15 average (3.49 % in 2003).

(5) The Czech Statistical Office monitors the structure of employment in three main branches of high-tech services: communications, computing technology related activities, research and development. The following table shows the development of this structure between 1995 and 2003 in per cents of the overall employment within the services in the Czech Republic.

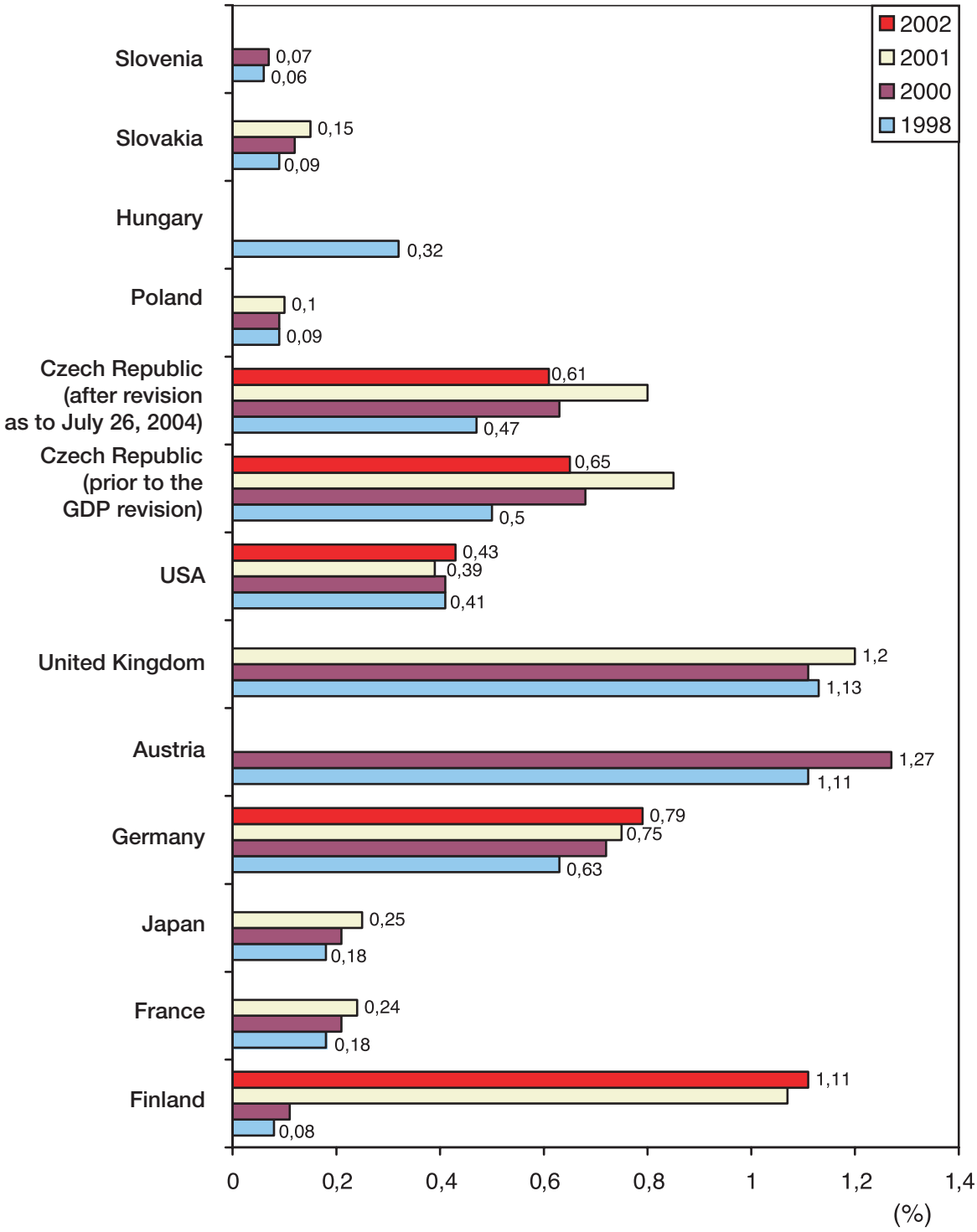
The structure of employment in the main branches of high-tech services in the Czech Republic between 1995 and 2003 (%)



Source: CSO, Selection survey of labour forces (communications + computing technology related activities + research and development = high-tech services, see the Graph A.1.6)

The share of workers in the computing technology areas in the overall number of workers in high-tech services is rising (from 23.3 % in 1995 to 31.2 % in 2003). The decline in the share of employees in research and development from 17.5 % in 1995 to 13.2 % in 2003 is everything else but gratifying. The share of employees in communications decreases more slowly.

A.1.7 Technology balance of payments (income/GDP in per cent)



Source: OECD MSTI 2004/1, CNB and CSO

Commentary:

(1) This indicator is a standard indicator of evaluation of national R&D policies, as well as of national innovation policies implying the technological level of economy, or more exactly the scope of foreign trade in industrial property and knowledge related to advanced technologies. The methodology and concept of this statistics is based upon the OECD Manual (Manual for the Measurement and Interpretation of Technology Balance of Payments Data – TBP Manual, OECD, 1990). The trade in technologies – the technology balance of payments – includes telecommunication and radio communication services, services of computing technology, technical services (project, design, testing and certification – not internal), author's fees and licence fees, research and development, purchase and sale of ownership rights and non-financial assets, etc.[9]

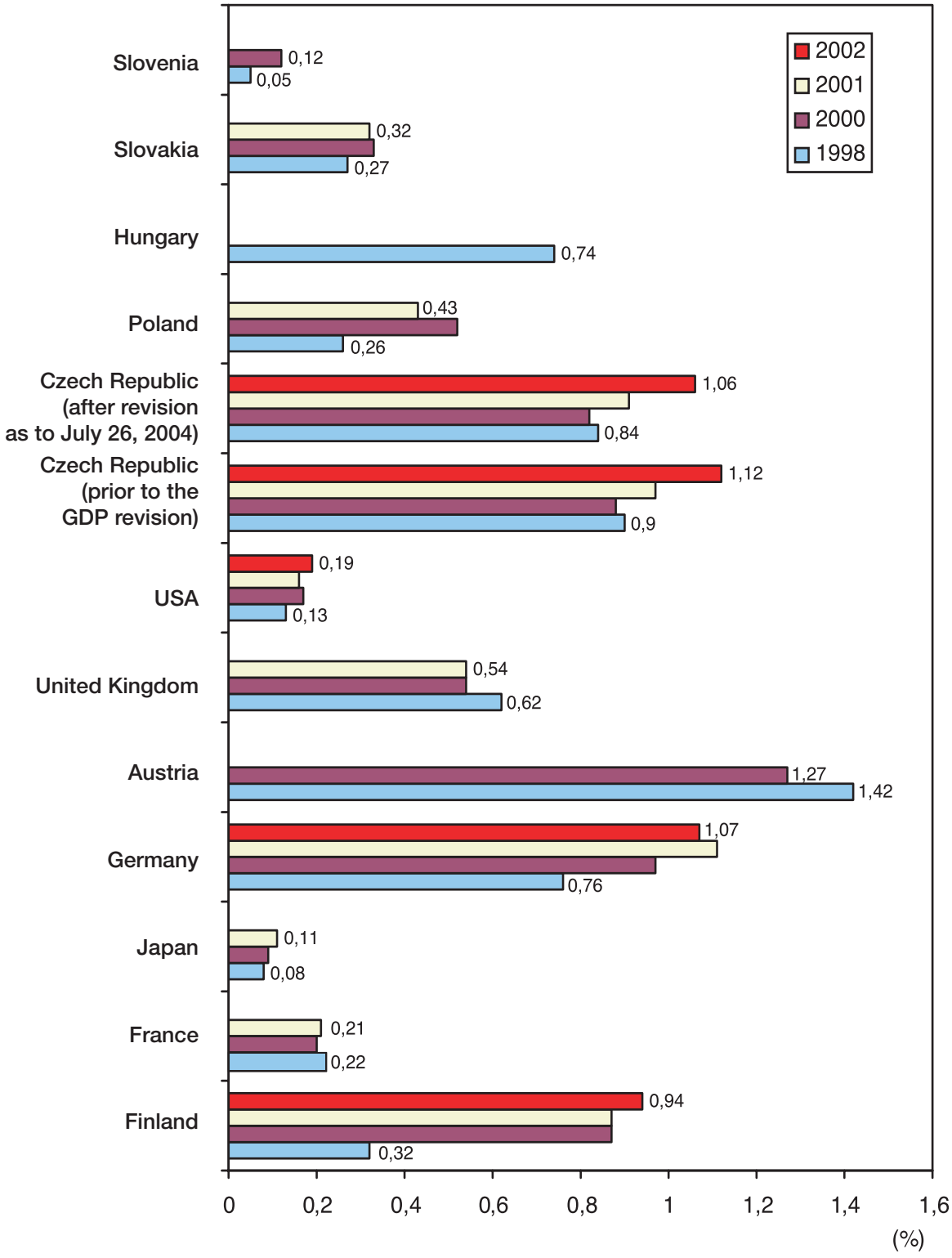
(2) The higher income of the technology balance of payments testifies to the higher level of respective services, their high quality, favourable prices and adequate marketing. The source of a high level of services included in the technology balance of payments is either a successful domestic research and development or sufficient and well-advised purchase of foreign equipment and know-how.

(3) The highest income is reported by Austria (1.27 % GDP in 2000), United Kingdom (1.2 % GDP in 2001) and Finland (1.11 % GDP in 2002). The income of Finland in the 2001 technology balance of payments increased significantly in comparison with 2000.

(4) The income of the Czech Republic in the technology balance of payments (0.65 % GDP in 2002) is markedly higher than in other monitored new Member States.

9 In the Czech Republic the branches classified in the technology balance of payments are laid down in the Czech National Bank Ordinance No. 514/2002.

A.1.8 Technology balance of payments (expenditure/GDP in per cent)



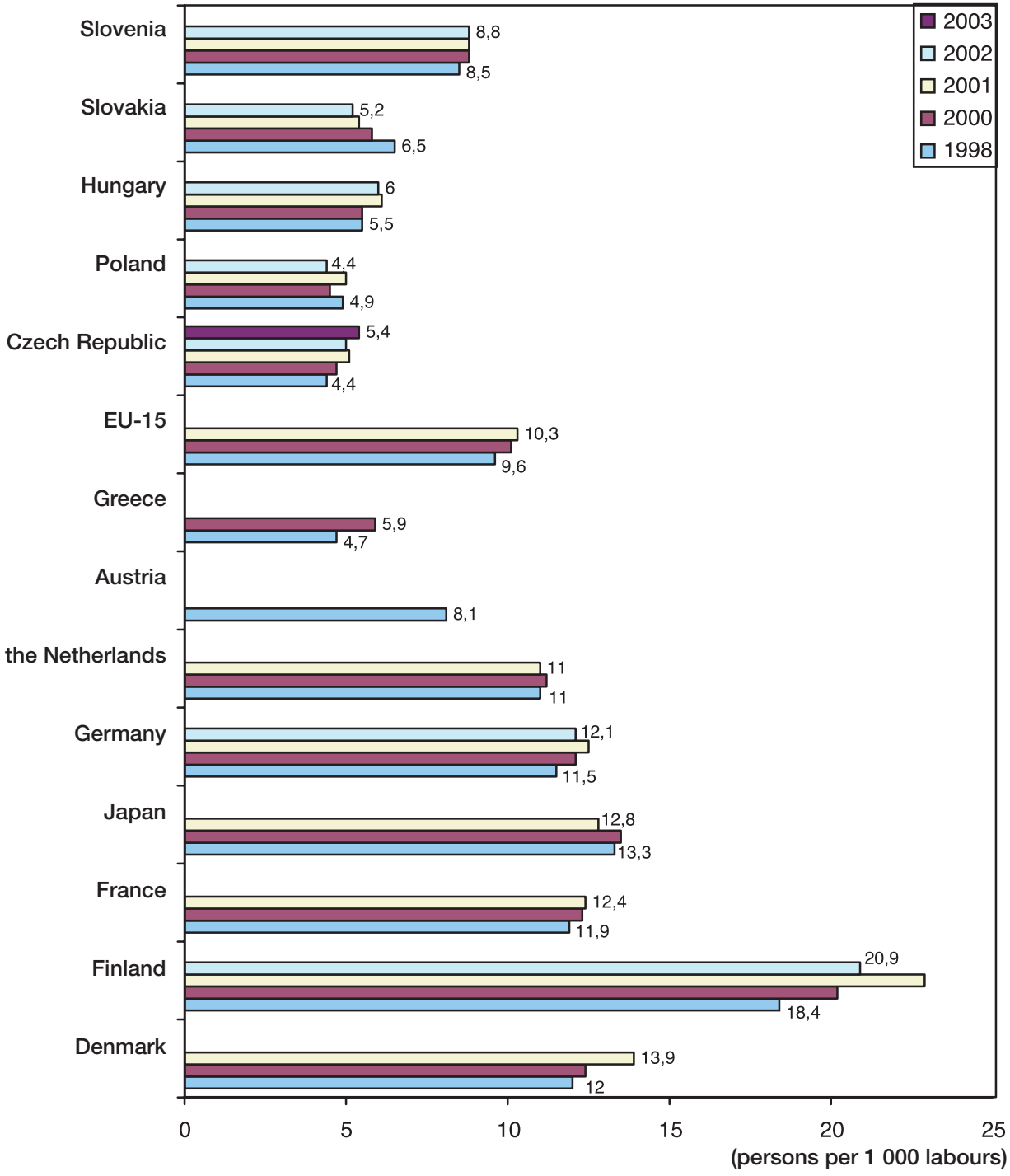
Source: OECD MSTI 2004/1, CNB and CSO

Commentary:

(1) Text under point (1) of the commentary on the previous graph of income of the technology balance of payments applies to the expenditure graph as well.

(2) Purchases in the Czech Republic in branches classified within the technology balance of payments attain the level of purchases in Germany. The level of both income and expenditure in the Czech Republic in these branches show evidence that there is a lot to sell and purchase. The level in other new Member States, except for Hungary, is substantially lower.

A.2.1 Number of R&D employees (FTE) (persons per 1 000 labours)



Source: CR – CSO (VTR-01), other countries – MSTI 2/2002

Commentary:

(1) The R&D employees mean the research workers performing directly the research and development, and auxiliary, technical, administrative and other employees on the R&D workplaces. Among the R&D employees there belong also employees procuring direct services to research and development activities like e.g. R&D managers, clerical workers, secretaries, etc. And on the contrary, those who carry out indirect services like e.g. factory canteen employees, security guards are excluded for this purpose. The official OECD statistics monitor two ratio indicators for international comparison: number of R&D employees per 1 000 of all employees and per 1 000 labours. The category of employees includes all persons being fifteen years old and older, and paid within the employment. The formal relation to employment means particularly the employment, contract of services and contract for work. On the other hand, the category of labours includes all persons being fifteen years old and older and meeting the requirements for being classified into the employed or unemployed. For most of the monitored countries data are available on the number of R&D employees per 1 000 labours.

(2) In most of the international comparisons the number of R&D employees is converted according to the Frascati Manual methodology to the full time dedicated to research and development activities (hereinafter referred to as FTE – Full Time Equivalent). This indicator is the best one for describing the actual time dedicated to research and development activities on the part of R&D employees. One R&D employee in FTE is equal to one year of work (full time) of an employee attending one-hundred-percent to the research and development activity. For employees concerned also with another activity than research and development only the relevant part of their working capacity is included thus avoiding the overestimation of data on the number of employees attending to research and development.[10] The FTE indicator includes in itself also the number of persons working for the reporting unit on the grounds of a contract of services or contract for work converted according to the methodology applicable for FTE.

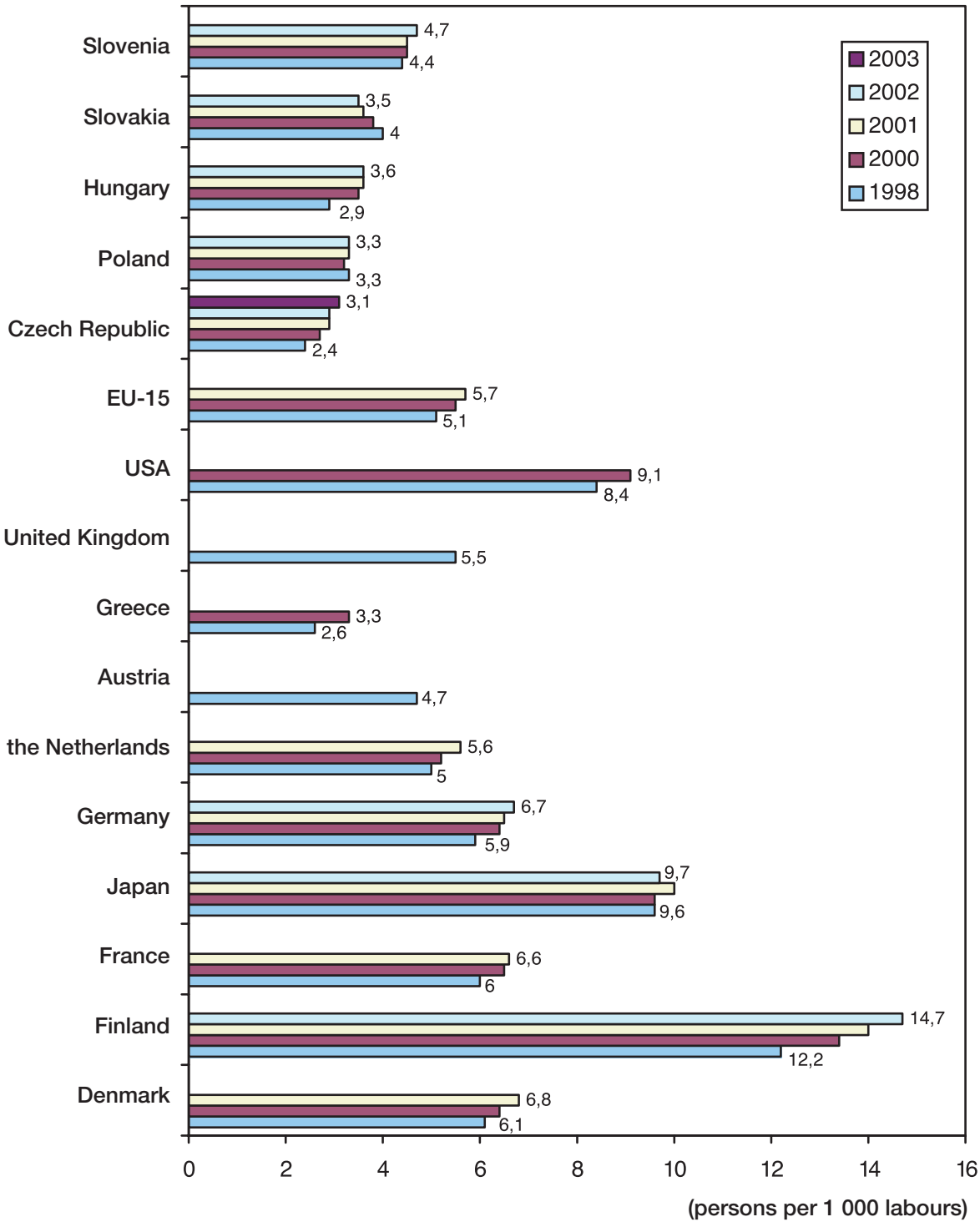
(3) The markedly highest relative numbers of R&D employees are reported by Finland. The 2002 decline to 20.9 persons per 1 000 labours could mean that the dynamic growth lasting in Finland since the middle of the nineties is coming to an end. Out of the monitored countries, the relative numbers of employees higher than the EU-15 average are reported by Denmark, Japan, the Netherlands and France.

(4) In the monitored new Member States and Greece the numbers of R&D employees significantly lag behind the EU-15 average. In the course of the evaluated period the Czech Republic experienced the increase in the number of R&D employees from 4.4 (in 1998) to 5.4 persons per 1 000 labours (in 2003). In Slovakia, the decline in the relative number of R&D employees continues; in 2002 to 4.4 persons per 1 000 labours being the lowest value of all monitored countries.

(5) The relative numbers of employees basically correlate with the amount of total R&D expenditures in individual countries as confirmed in the third section of Part A of the analysis. The countries with higher R&D expenditures report higher numbers of R&D employees, and vice versa.

10 Example: If a pedagogic worker is employed half time and dedicates only half of his/her working time to research and development, with the rest dedicated to other activities (pedagogic activity), then the value of this employee for activity in research and development measured by means of FTE is equal to 0.5 . 0.5 = 0.25.

A.2.2 Number of research workers (FTE) (persons per 1 000 labours)



Source: OECD MSTI 2004/1 and CSO

Commentary:

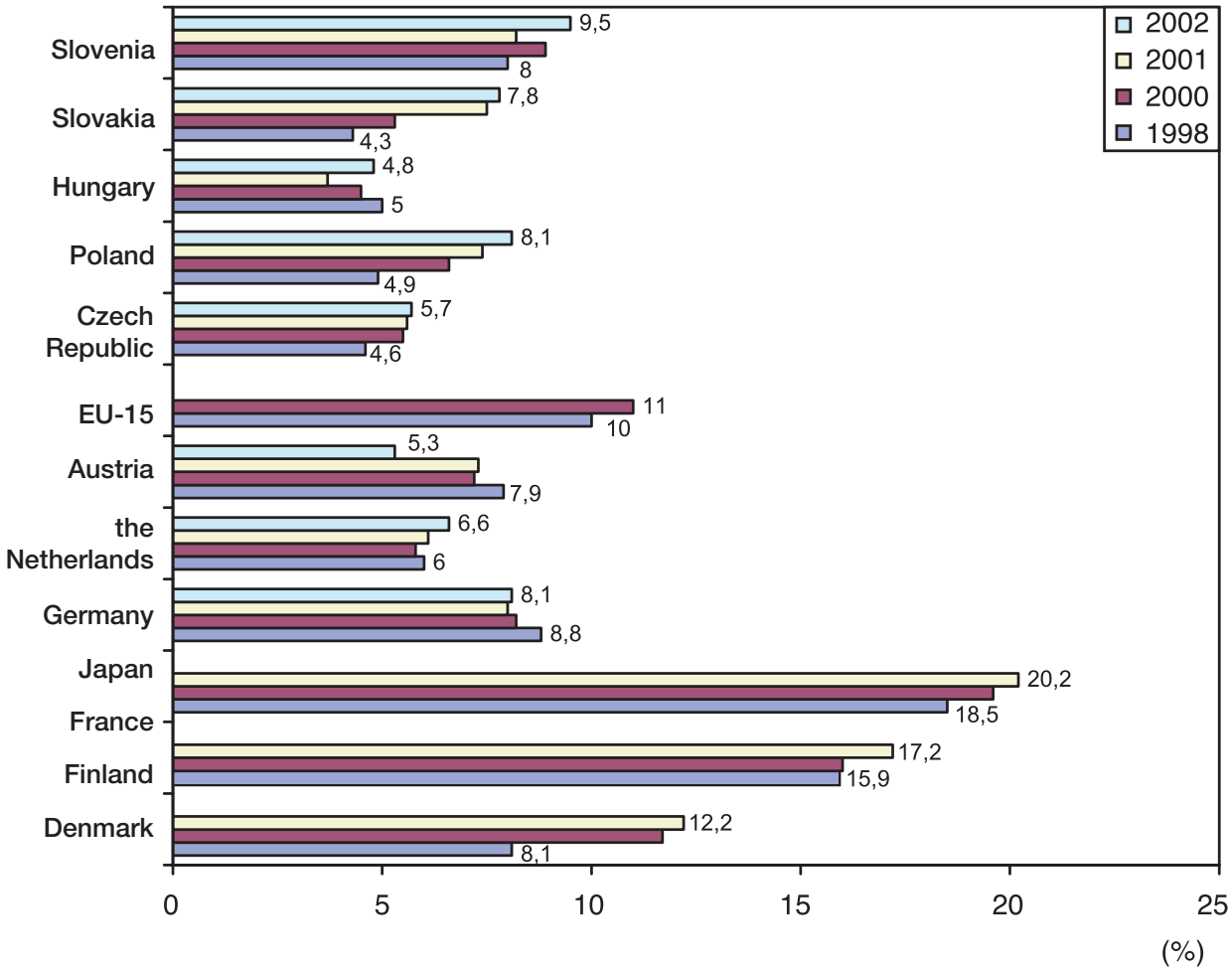
(1) The research workers are concerned with the concept or creation of new knowledge, products, processes, methods and systems, or manage such projects. They represent the most important group of R&D employees. They are mostly employees classified in the main class 2 (Scientific and special intellectual workers) and sub-group 1237 (Managers of research and development departments) of the applicable Classification of occupations – extended (KZAM-R). It is the most frequently used international indicator for comparison of human resources being active in research and development. Otherwise the note on methodology (2) to the Graph A.2.1 applies to this indicator as well.

(2) The average of EU as a whole in 2001 (5.7 research workers per 1 000 labours) is again significantly exceeded by Finland (14.7 in 2002) and Japan (9.7 in 2002) and USA (9.1 in 2000).

(3) The relative number of research workers in the Czech Republic grows at a pace (by 29 % from 1998 to 2003) that is a little bit higher than the pace of growth of the relative number of R&D employees (by 22 % in the same period). The relative number of research workers in the Czech Republic is a slightly higher than in other monitored new EU Member States. At the same time the R&D expenditures in the Czech Republic are higher than in other new Member States, with the exception of Slovenia.

(4) It results from comparison of figures between A.2.2 and A 2.1 Graphs that in most of the monitored countries the research workers themselves amounts to ca 50 per cent of the overall number of R&D employees. Only Japan differs, the share of the research workers being higher than 70 per cent (76 % in 2002). It testifies to the somehow different organisational arrangement of research and development in Japan and on the lower “provision” of the Japanese research with auxiliary and technical workers. This fact is confirmed also by the Japanese analytical materials on research and development. Also in Finland this share is higher than in other monitored countries (61 % in 2001 and 70 % in 2002).

A.2.3 Share of the Science&Engineering[11] graduates in the tertiary level of education out of inhabitants of the 20–29 years age category (in per cent)



Source: Eurostat 2004

11 In accordance with the International Standard Classification of Education ISCED 97 it covers following educational subjects: biological sciences 42, physical and chemical sciences 44, mathematical sciences and statistics 46, informatics and computing technology 48, technical sciences and technically oriented crafts 52, production and manufacturing industries 54, architecture and civil engineering 58.

Commentary:

(1) This share represents very frequently used indicator for evaluation and mutual comparison of research and innovation policies and the overall competitiveness (EU, the United States, Japan, papers for the annual meetings of the World Economic Forum). Sometimes the indicator is used in the form of a share in the total number of university graduates of the same age category between 20 and 29 years. This fact does not mean any underestimation of the social science studies. The graduates in the Science&Engineering study programmes on the universities are considered, however, the basic potential for activity in that part of research and development that is able to influence the competitiveness most.

(2) Out of the monitored countries, the share of Science&Engineering graduates in the Czech Republic is the second lowest (5.7 %), lower being only in Hungary (4,8 %). The decline in Austria from 7.3 % in 2001 to 5.3 % in 2002 is evidently unrealistic (either change in methodology or mistake). It may be state on aggregate that with the exception of Slovenia this share in the new Member States is approximately half as big as the figure for EU as a whole (10.3 %).

(3) This indicator reaches the highest values in France (20.2 % in 2001), Finland (17.2 % in 2001) and Denmark (12.2 % in 2001). Surprisingly low shares – lower than 10 % – are in Germany, Austria and the Netherlands.

(4) The situation particularly in countries with a low share of inhabitants with university education or low share of young people studying on universities respectively, seems somewhat different when the number of students of Science&Engineering study programmes is expressed as a share in the overall number of university students of the same age category; see the following table.

Share of Science&Engineering students in the overall number of university students in 2001 (ISCED – categories 5B, 5A and 6) (%)

Czech Republic	Denmark	Finland	Japan	Hungary	Germany	The Netherlands	Poland	Slovakia	Slovenia	United Kingdom
31,3	20,8	36,8	21,9	20,4	29,1	16,5	19,9	28,3	22,5	27,9

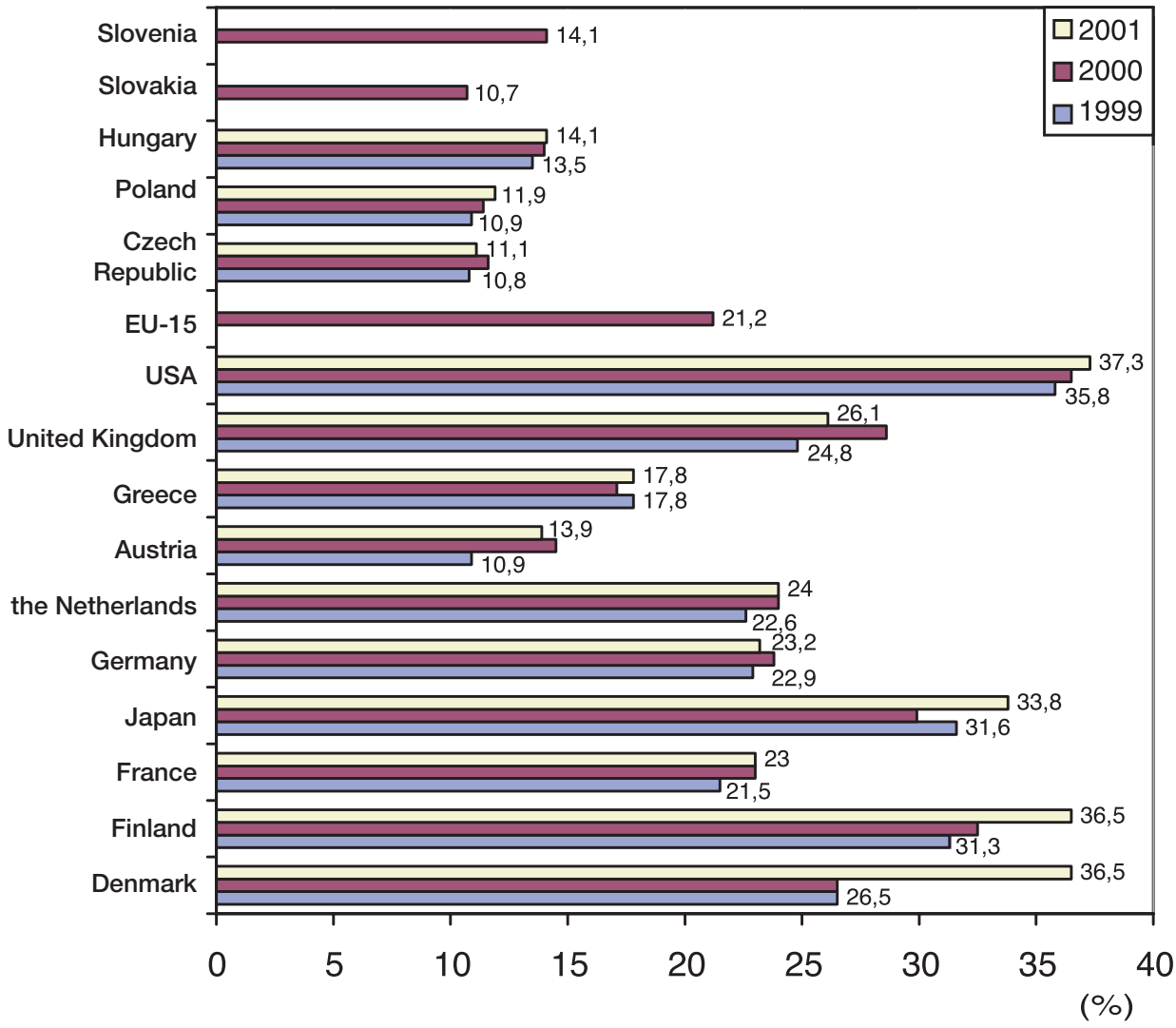
Source: European Commission – COM (2003) 685, final wording

The differences between the monitored countries are not so marked as when expressed by share in the numbers of inhabitants. Out of the monitored countries, the highest share is reported by Finland (36.8 %), followed by the Czech Republic (31.3 %) and Germany (29.1 %).

(5) This shortage of adequately qualified workers for research and development in many countries is caused by reasons of two kinds. The study of Science&Engineering subjects is generally regarded to be more difficult and fruitification of the gained knowledge is usually postponed as a rule. The second reason is the cultural and social awareness. The young generation in many countries feels aversion against technique and technologies.

(6) Without a significant increase in the number of university students in the Czech Republic no marked positive changes in the share of the Science&Engineering study programmes graduates can be expected.

A.2.4 Share of inhabitants with completed tertiary level of education[12] in the total number of inhabitants of the 25–64 years age categories (in per cent)



Source: OECD, Education at a Glance, 2003, 2001

12 The tertiary level of education according to the International Standard Classification of Education ISCED 97 followed by all OECD countries covers the categories 5A, 5B and 6, to which most of the educational programmes are classified that follow after the school leaving examinations and last for at least two years of presentation studies. In the conditions of the Czech Republic the tertiary level of education includes the education on universities, colleges (in the past also studies after the school leaving examinations), last two years of studies on conservatories, etc. In our conditions the so called long, typically university master study programmes prevail in the tertiary education (ISCED category 5A) enabling graduates further studies in the doctorate study programmes (ISCED category 6; leading to Ph. D. title).

Commentary:

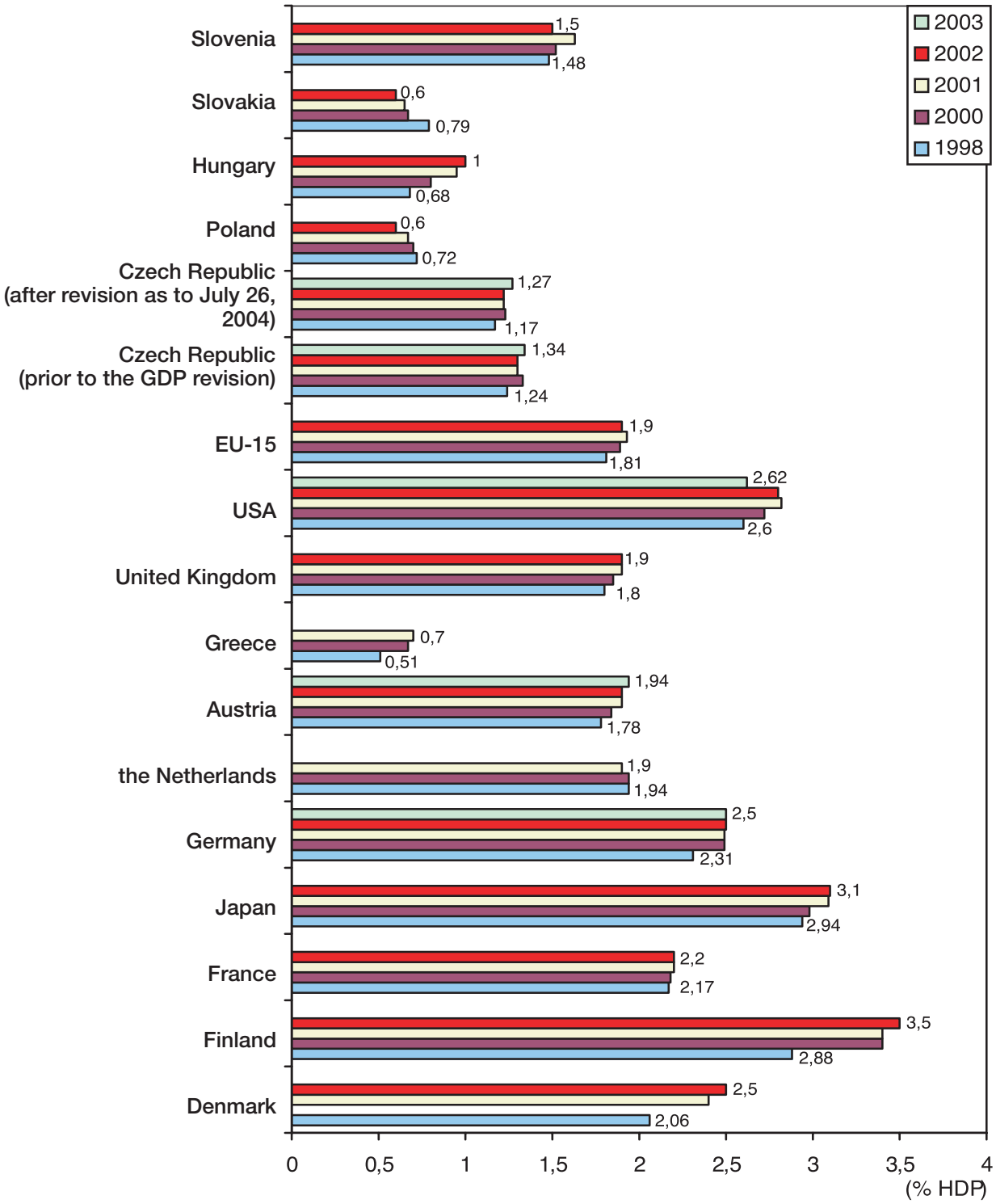
(1) The graph depicts another very frequently used indicator for evaluation of potential capacities of human resources for research and development and use of their results.

(2) Out of the monitored countries, the share of inhabitants with university education exceeded the value of 30 % in the United States (37.3 %) and Denmark (36.5 %) in 2001.

(3) It is generally known that in the Czech Republic the share of inhabitants having university education is one of the lowest of all OECD member states (11.1 % in 2001). Similar situation is in other monitored new EU Member States.

(4) Without a significant increase in the number of university students no marked positive changes in the share of the natural science and technical study programmes graduates can be expected.

A.3.1 Total R&D expenditures (% of GDP)



Source: OECD MSTI 2004/1 and CSO

Commentary:

(1) The R&D expenditures are the most famous and most frequently used indicator in the international comparison of research and development. These expenditures represent overall expenditures from public, private (business or non-business) and foreign sources.

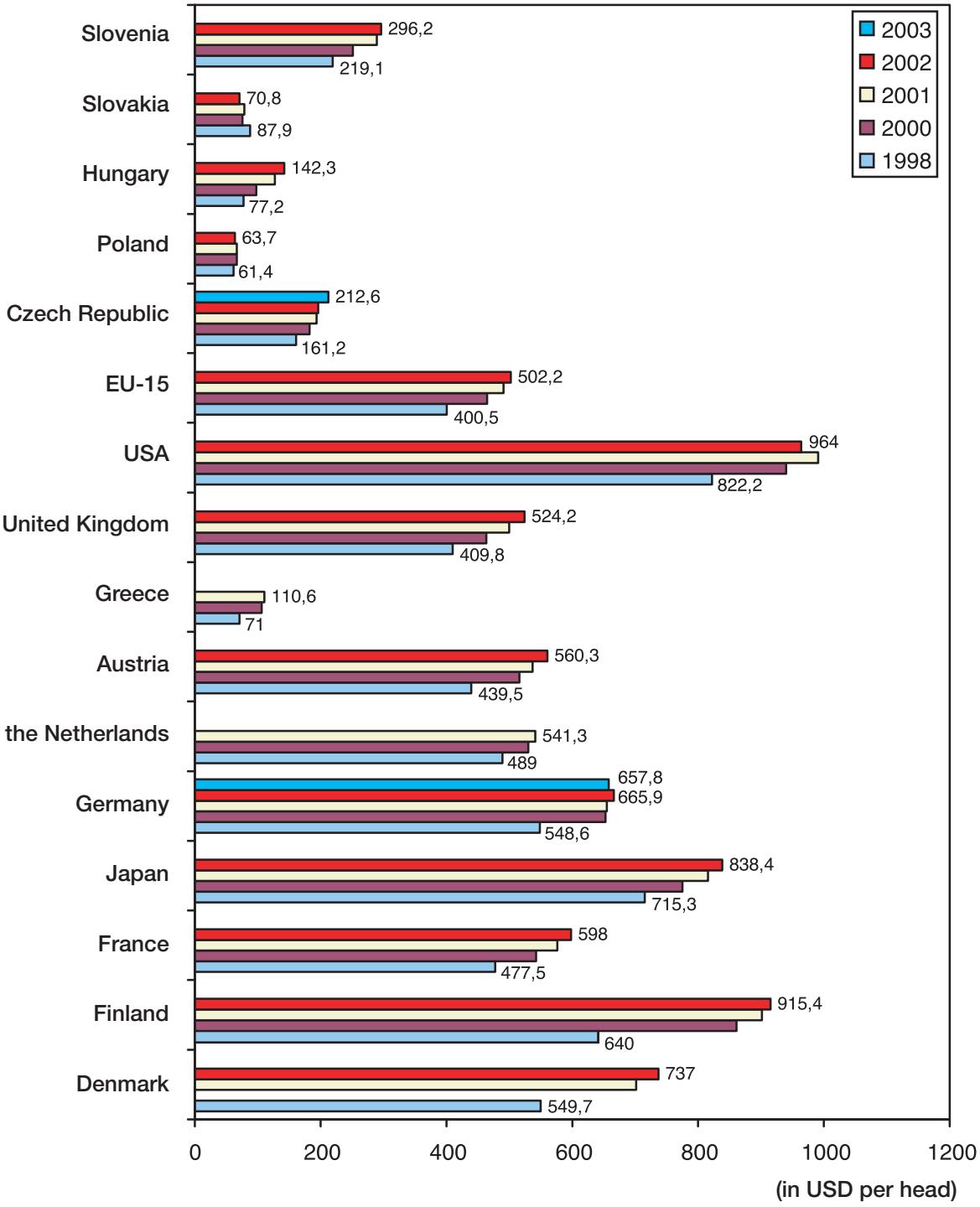
(2) In the monitored period between 1998 and 2003 the total R&D expenditures in EU-15 experienced a moderate increase from 1.81 % in 1998 to 1.9 % of GDP in 2002. In many Member States the R&D expenditures basically stagnate. A dynamic increase was experienced in Finland (from high value of 2.88 % in 1998 to 3.5 % in 2002). A moderate growth in R&D expenditures took place in Austria.

(3) It is nearly certain that without extraordinary measures not many EU Member States and EU as a whole will be able to attain in 2010 the target set on the 2002 spring European Council meeting in Barcelona: expenditures in the level of 3 % of GDP, of this 1 % from public sources and 2 % from private sources. The OECD publication “Science, Technology and Industry: Scoreboard 2003” states that in 2001 the R&D expenditures exceeded the level of the above 3 % of GDP only in Finland, Sweden, Japan and Island.

(4) The extraordinary revision of GDP figures in the Czech Republic made in 2004 led to increase in the GDP figures that manifested itself in reduction of the relative R&D expenditures nearly by 0.1 of the percentage point. Out of the monitored new EU Member States, the highest expenditures are reported in Slovenia (1.5 % of GDP in 2002), followed by the Czech Republic (ca 1.3 % of GDP in 2003) and Hungary (1 % of GDP in 2002). In the evaluated period Hungary is reporting the annual marked growth in expenditures (from 0.68 % in 1998 to 1 % of GDP in 2002).

(5) In 2002 the expenditures in the Czech Republic attained the level of 67 % of expenditures in EU. This value corresponds relatively well with the level of GDP per head amounting in the Czech Republic to ca 60 % of EU as a whole. It is generally known that the developed “richer” countries spend more on research and development than the countries less developed. Great fall took place in Slovakia, from 0.95 % of GDP in 1996 to 0.65 % in 2002.

A.3.2 Total R&D expenditures (in USD per head; current prices, PPP)



Source: OECD MSTI 2004/1 and CSO

Commentary:

(1) The indicator of total R&D expenditures in per cent of GDP gives only incomplete information. The really spent funds depend on the amount of GDP. Therefore the analytical materials use another indicator – total R&D expenditures in USD per one inhabitant of the country in question. As a rule this indicator is given in currency of the respective country converted to USD using the purchasing power parity (PPP). At this conversion a small distortion may occur because some inputs to research and development (apparatuses, materials, etc.) are generally bought in abroad according to the official rate of exchange of the currency in question. Nevertheless, the indicator is considered to be highly objective. The chart values are given in current prices of respective years.

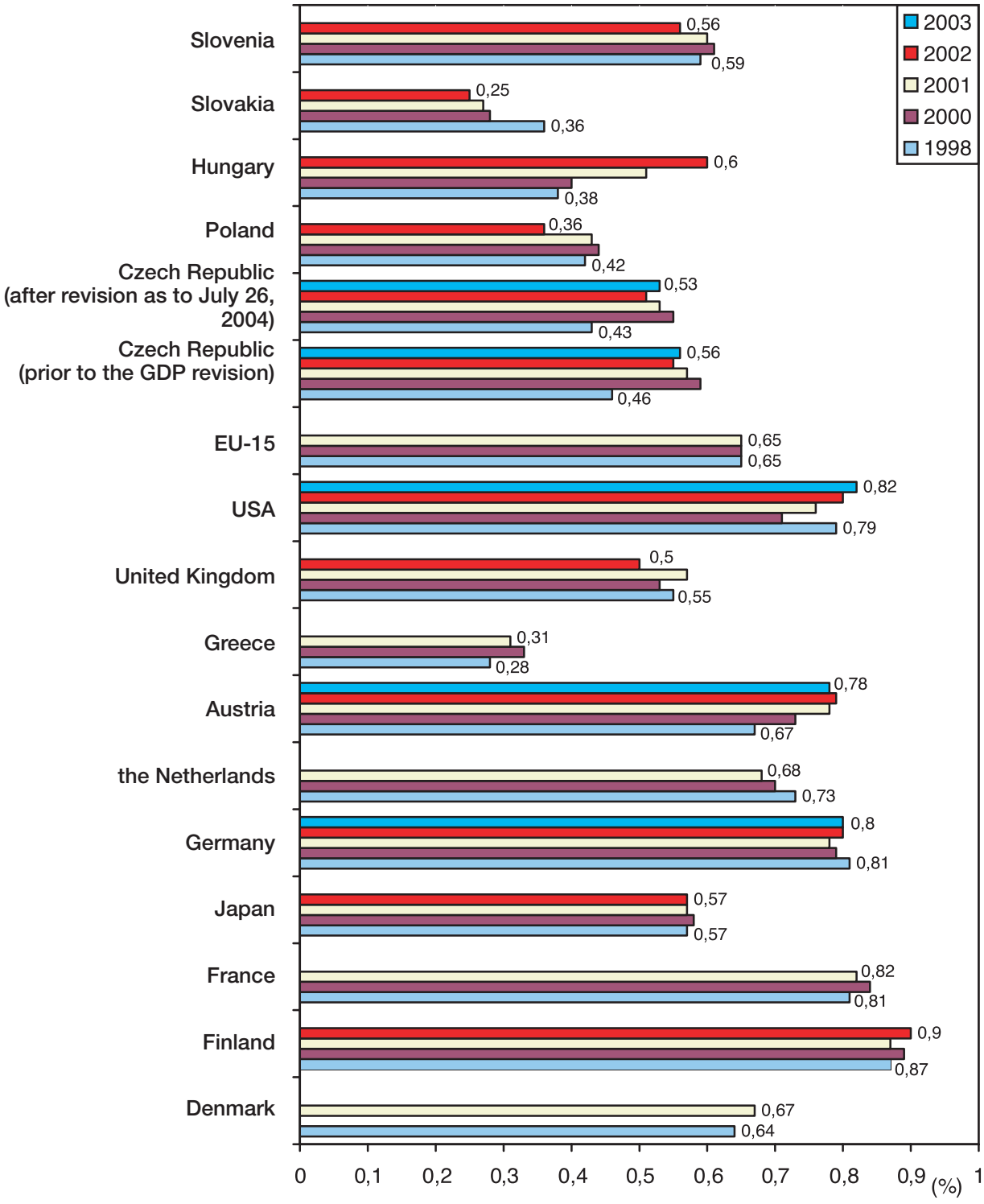
(2) Markedly highest are expenditures in the United States (964 USD per head in 2002), then in Finland (915.4 USD per head in 2002) and Japan (838.4 USD per head in 2002).

(3) Out of the monitored new Member States, the highest expenditures are reported by Slovenia (296.2 USD per head in 2002), followed by the Czech Republic (196.2 USD per head in 2002, with further growth to 212.6 USD per head in 2003) and Hungary (142.3 USD per head in 2002). A dynamic increase in expenditures takes place in Hungary and Slovenia. The R&D expenditures decline in Slovakia.

(4) The expenditures in the Czech Republic (196.2 USD per head in 2002) attain the level of only 39.1 % of the average expenditures in EU-15 (2002), or 35 % of the R&D expenditures in Austria (2002) respectively.

(5) The increments of R&D expenditures in USD per head are higher in the monitored countries than the increments of expenditures measured in % of GDP; the reason being the GDP growth in these countries. The amount of R&D expenditures in USD per head must be taken into account when interpreting the values of such indicators like the number of patents, number of scientific publications and their citations. The lagging of the Czech Republic in the numbers of publications, citations and patents behind the monitored EU-15 Member Sates will not be so abysmal in many cases when taking into account the actual amount of R&D expenditures. On the other hand the lagging behind Hungary in certain efficiency indicators will be higher when taking into account also the actual amount of R&D expenditures.

A.3.3 Public R&D expenditures (in per cent of GDP)



Source: OECD MSTI 2004/1 and CSO

Commentary:

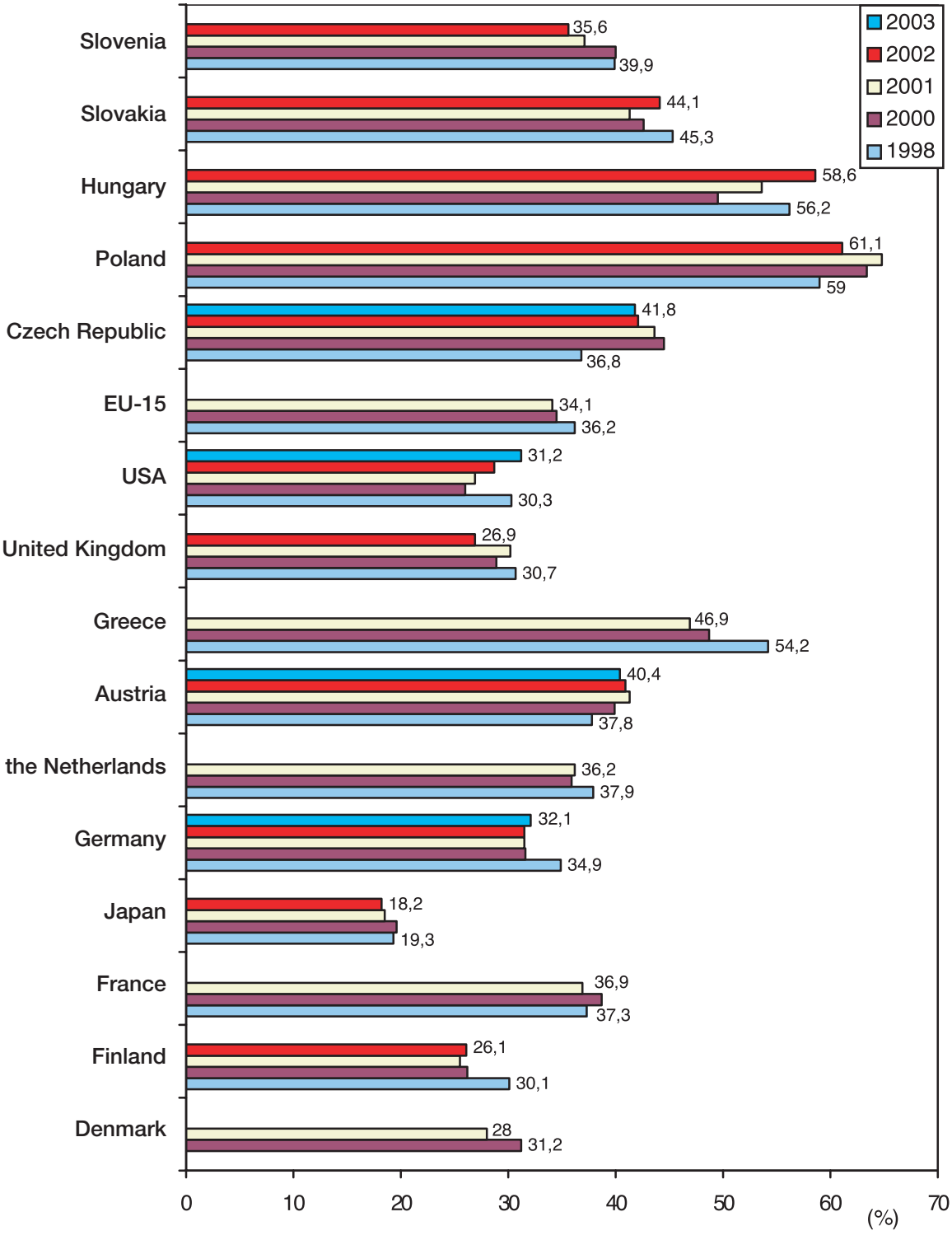
(1) Again, there are two sets of figures reported for the Czech Republic – prior to the GDP revision and after the GDP revision made in 2004 and leading to increase in the level of GDP in the monitored years.

(2) The 2003 R&D Analysis did not mention this indicator. Its importance is growing in context with evaluation of the Lisbon strategy fulfilment (specified in Barcelona in 2002), according to which the overall R&D expenditures should attain the level of 3 % of GDP, of this 1 % of GDP from public sources, until 2010.

(3) The highest level is attained by Finland (0.9 % of GDP in 2002), followed by USA (0.82 % of GDP in 2003) and France (0.82 % in 2001), which are countries with high overall amounts of R&D expenditures.

(4) Out of the new EU Member States, Hungary reported the highest expenditures (0.6 % of GDP in 2002) at a remarkable growth (0.38 % of HDP in 1998). Then follows Slovenia (0.56 % of GDP in 2002) and the Czech Republic (also 0.56 % of GDP in 2003, or 0.53 % of GDP after the GDP revision respectively). Over the monitored period the R&D expenditures of Slovakia has been falling down relatively quickly.

A.3.4 Share of public funds in total R&D expenditures (in per cent)



Source: OECD MSTI 2004/1 and CSO

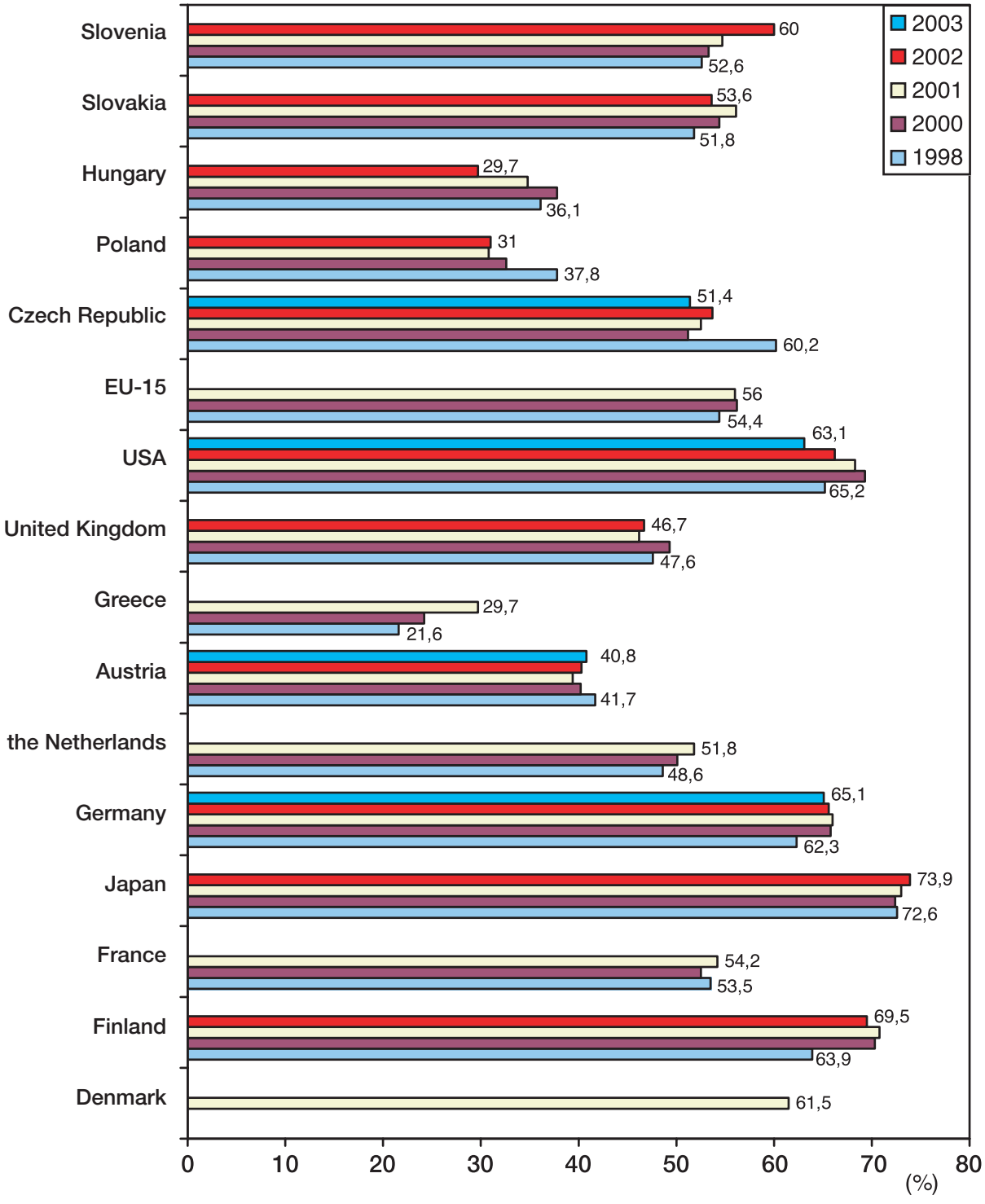
Commentary:

(1) This indicator gives account on the degree of liberalism of the economy (scope of the private sector) and is influenced by the structure of economy, particularly the share of large enterprises, and structure of the research base. The conception materials on research and development in abroad often express the opinion that the optimum share of public funds moves in the range from 30 % to 40 % of the total R&D expenditures. The already mentioned EU Lisbon Strategy anticipates the total R&D expenditures in the amount of 3 % of GDP, of this 1 % from public funds and 2 % from private funds.

(2) In most of the monitored countries this indicator stagnates or slightly goes down; in EU as a whole from the value of 36.2 % in 1998 to 34.1 % in 2001. A certain exception is USA where after decline in 2000 to 26 % they experienced an annual growth up to the figure of 31.2 %. Even though the share of public funds in the total R&D expenditures remains relatively low. Another country with rising share of public expenditures is Hungary, after decline in 2000 to 49.5 % the share has experienced a relatively fast growth up to 58.6 % in 2002.

(3) Higher than 50 % shares of public expenditures in the total R&D expenditures are reported by Poland and Hungary. The lowest share of the monitored countries shows Japan (18.2 % in 2002), then follows Finland (26.1 % in 2002) and the United Kingdom (26.9 % in 2002). Step by step the Czech Republic and Slovenia are approaching the recommended 1/3 share of public sources in the total R&D expenditures.

A.3.5 Share of private funds in total R&D expenditures (in per cent)



Source: OECD MSTI 2004/1 and CSO

Commentary:

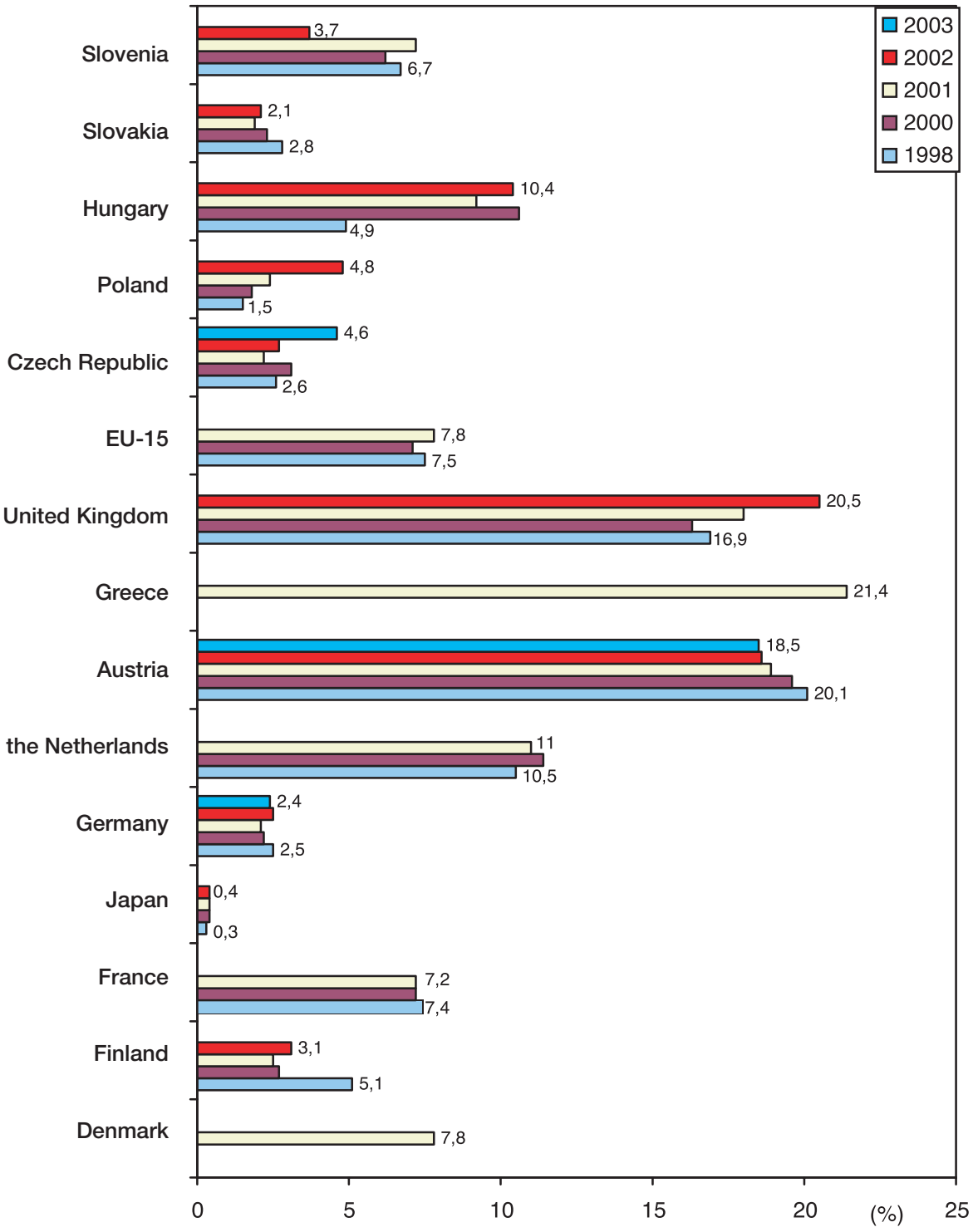
(1) The values of private funds shares in the total R&D expenditures for most of the countries, or more exactly for countries with low support of research and development from abroad, logically supplement the values given in Graph A.3.3. In most of the monitored countries the private funds are the largest source of funds for the R&D support. The same applies to the increase and decrease in the private funds shares. The share of public funds is falling down in most countries, while the private funds share is going up.

(2) The share of private funds in EU-15 as a whole increased from 54.4 % in 1998 to 56.0 % in 2001.

(3) Very high shares of private funds are reported by Japan (73.9 % in 2002), Finland (65.1 % in 2003), and the United States (63.1 % in 2003). In all of these countries there are large enterprises applying modern technologies with extraordinary high R&D expenditures.

(4) The share of private funds in the Czech Republic (51.4 % in 2003) is significantly higher than in Hungary (29.7 % in 2002) and Poland (31 % in 2002), but lower than in Slovakia (53.6 % in 2002) and Slovenia (60 % in 2002).

A.3.6 Share of foreign funds in total R&D expenditures (in per cent)



Source: OECD MSTI 2004/1 and CSO

Commentary:

(1) The foreign funds are the third most important source of R&D financing. The share of the fourth source being the private non-business sources (private foundations, etc.) is marginal, except for the United States. The foreign funds include both private funds and public funds (EU programmes, other international programmes, etc.).

(2) In EU-15 the share of foreign funds moves slightly above 7 per cent. In 2002 this share attained the level of 7.8 %.

(3) The highest share of foreign funds is reported by Greece (21.4 % in 2001), followed by the United Kingdom (20.5 % in 2002) and Austria (18.6 % in 2003).

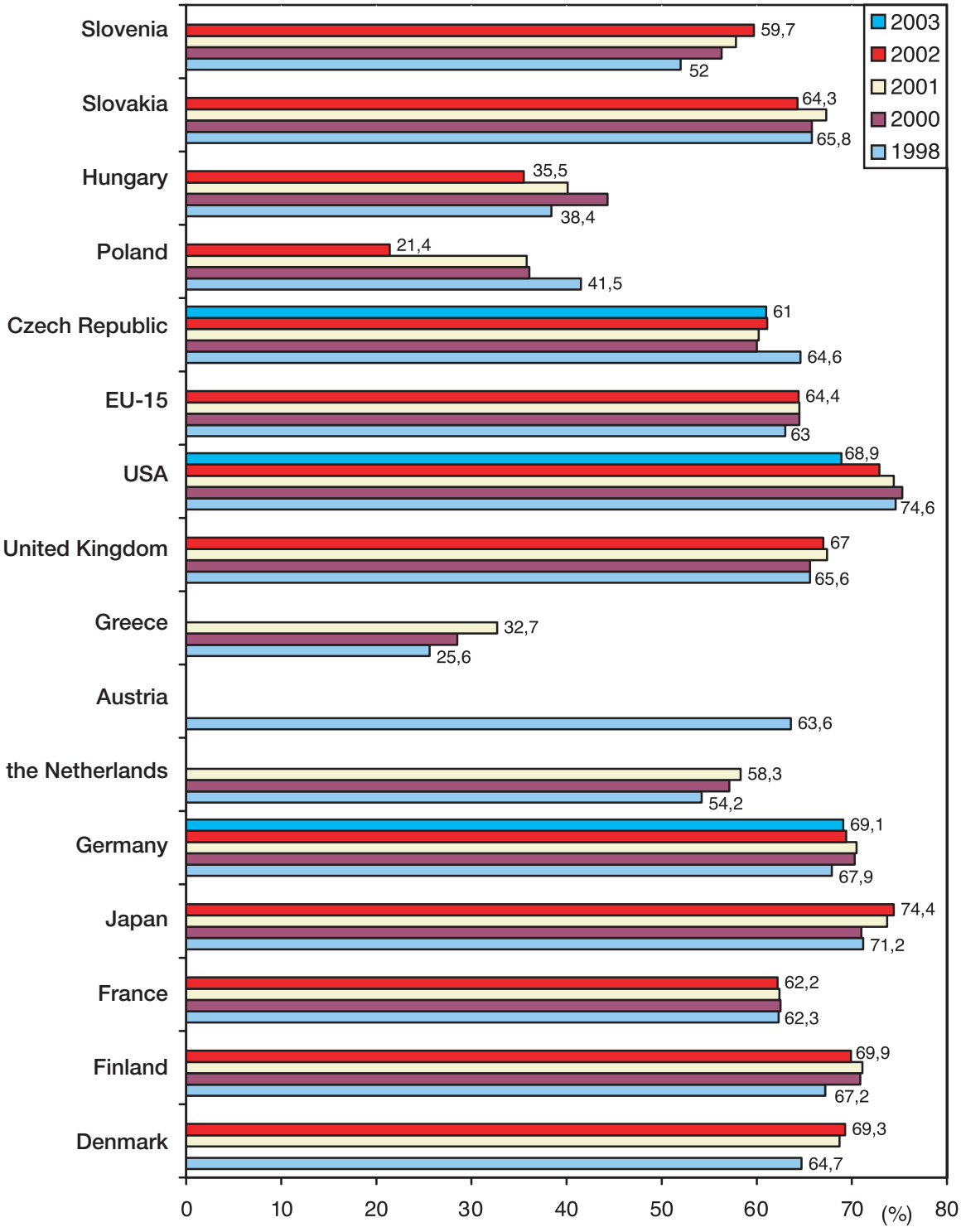
(4) Relatively high shares, higher than the EU-15 average, show the Netherlands and France. In the countries mentioned under points (2) and (3) the expenditures are particularly those of large foreign and multinational enterprises having their branches in these countries. The same applies also to Hungary.

(5) Out of the new EU Member States, the highest share of foreign funds is reported by Hungary (10.4 % in 2002). The share of foreign funds has more than doubled in Hungary since 1998.

(6) Very low shares are reported by Japan – less than 0.5 %. The reason is a very low share of branches of foreign enterprises and considerably limited scope of the direct foreign co-operation in research and development financed from foreign funds.

(7) In 2003, after a certain period of stagnation the share of foreign funds increased to 4.6 % in the Czech Republic. It would be desirable that the growth in foreign investments into research and development in the Czech Republic continues even further.

A.4.1 Share of R&D funds used in the private sector in the total R&D expenditures (in per cent)



Source: OECD MSTI 2004/1 and CSO

Commentary:

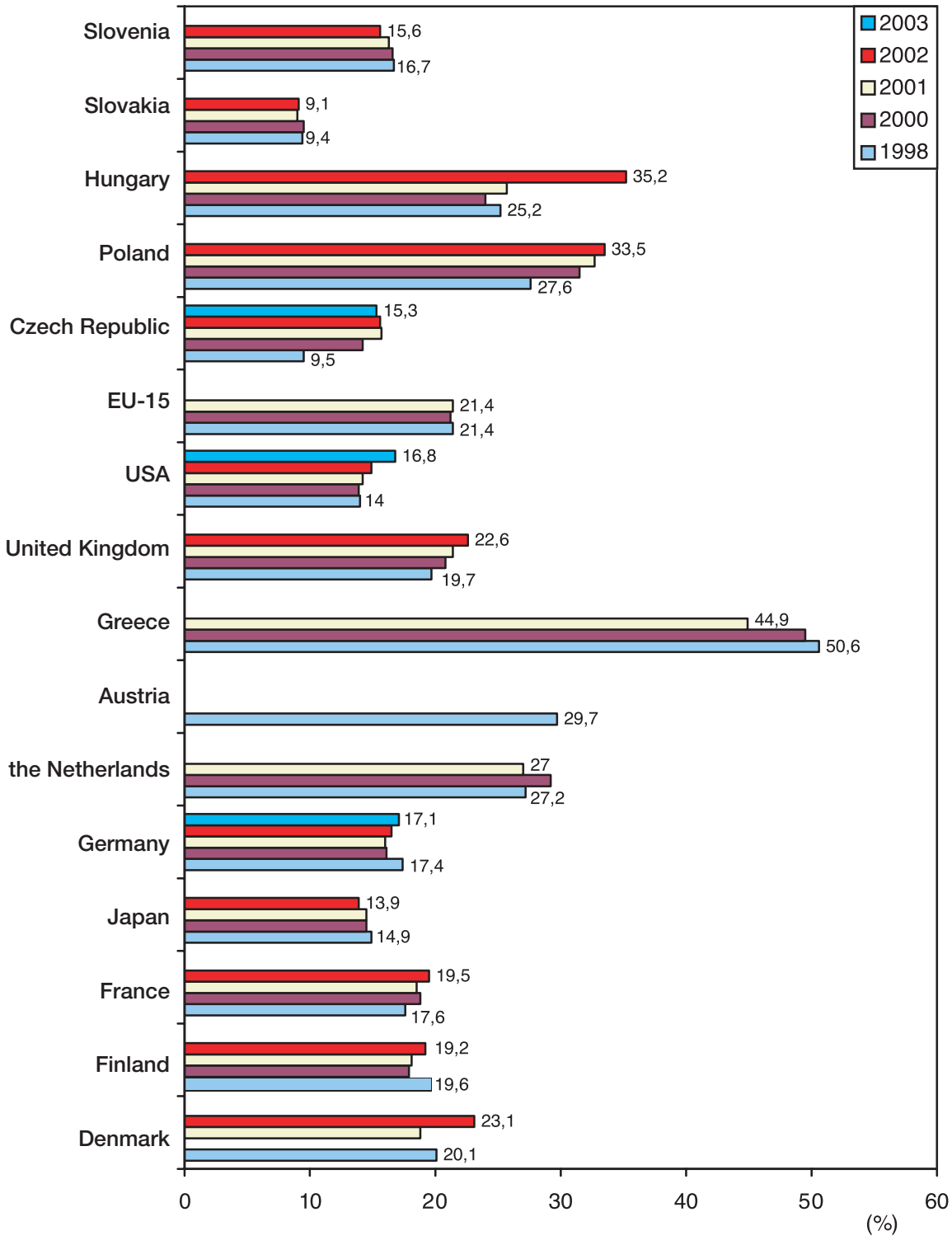
(1) The foreign analyses and statistics monitor three user sectors: private, universities and the so called governmental sector. The governmental sector largely includes the research organisations of a non-business character supported from public funds. In the Czech Republic the governmental sector includes the institutions of the Academy of Sciences of the CR and departmental research institutions.

(2) In most of the OECD member states the majority of funds spent on research and development is directed into the private sphere; the highest amount in Japan (74.4 % in 2002) and until 2002 in USA (72.9 % in 2002 with decline to 68.9 % in 2003).

(3) In most of the monitored countries, including the Czech Republic, the share of funds spent on research and development in the private sphere moves between 60 and 70 %. The EU-15 average was 64.4 % in 2002.

(4) The lowest shares of the total R&D funds spent in the private sector are reported by Poland (21.4 % in 2002) and Greece (32.7 % in 2001). The industry of both these countries has a low portion of research-intensive branches. It follows from the next graphs that Greece has the highest share of funds spent at universities (see the Graph 4.2) and Poland in the governmental sector (see the Graph 4.3).

A.4.2 Share of R&D funds used at universities in the total R&D expenditures (in per cent)



Source: OECD MSTI 2004/1 and CSO

Commentary:

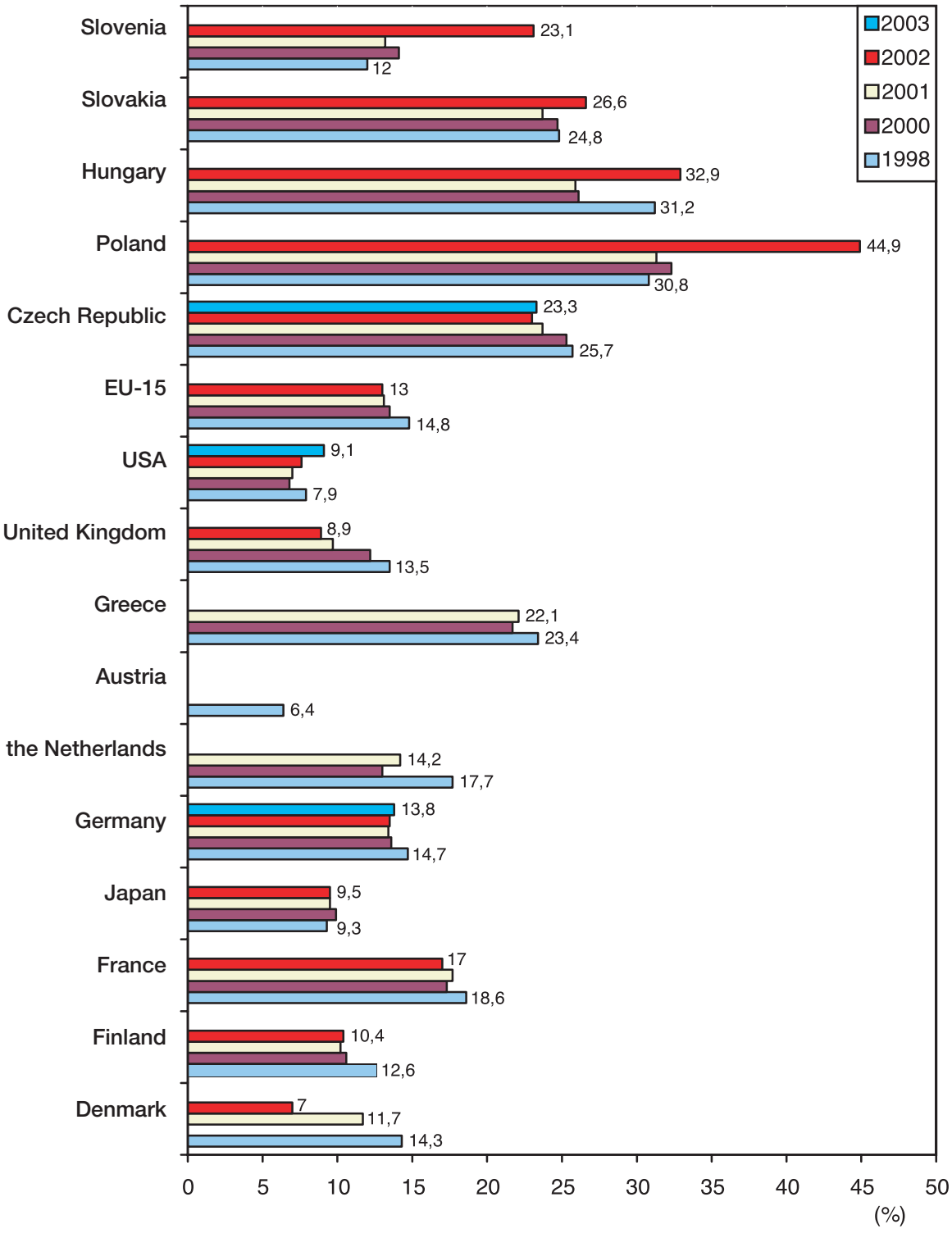
(1) All over the world the universities belong among the important sectors performing research and development. The benefit and necessity of uniting the research with the university education are not doubted anywhere in the world. The shares of universities in the total R&D support differ according to various countries. First and foremost they are influenced by the development and tradition until now, structure of the research base and structure of the industry, or the share of industrial sectors imposing high demands on R&D respectively.

(2) Within EU-15 the share of use of total R&D funds at universities has been moving around 21 % (21.4 % in 2001) during the monitored years. Out of the EU-15 countries, it is highest in Greece (44.9 % in 2001), then follows Austria (29.7 % in 1998 - for recent years data are not available) and the Netherlands (27.0 % in 2001).

(3) The non-European developed countries, namely the United States and Japan, report very low shares of funds spent at universities, in both countries deeply below 20 %. Out of the monitored countries, less is reported only by Slovakia (9.1 % in 2002).

(4) In the Czech Republic the share of universities increased from 9.5 % in 1998 to 15.7 % in 2002, with a recent moderate decrease (15.3 % in 2003), but still is lower than the EU average – the above mentioned 21 %.

A.4.3 Share of R&D funds used in the public (governmental) sector in total R&D expenditures (in per cent)



Source: OECD MSTI 2004/1 and CSO

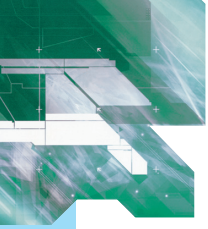
Commentary:

(1) According to the OECD methodology explained in a great detail in the so called Frascati Manual the governmental sector means the public research organisations having all types of legal forms. In the Czech Republic the governmental sector includes the institutions of the Academy of Sciences of the CR and departmental research institutions. The statements about the dependency of the evaluated sector's share on the development, traditions, structures of research and industry mentioned in point (1) of the commentary to Graph A.4.2 apply also to the public (governmental) sector.

(2) With the exception of Slovenia, Poland and to a certain extent also Slovakia, where the share of the public sector increases, and Japan, where it stagnates, in most of the monitored countries the share of public sector declines. It is the result of the already mentioned liberalism of economies and efforts to redistribute fewer funds through the state budget.

(3) In EU as a whole the share of public sector fell down from 14.8 % in 1998 to 13 % in 2002. Out of the EU-15 countries, the highest share of governmental sector is in France (17 % in 2002). The lowest shares of governmental sector within EU-15 are reported by Denmark (7 % in 2002) and the United Kingdom (8.9 % in 2002). Shares of governmental sector lower than 10 % are reported also by Japan and USA.

(4) In the Czech Republic the share of governmental sector declined from 25.7 % in 1998 to 23 % in 2002, than in 2003 it experienced a moderate increase to 23.3 % thus arriving at the current level of the governmental sector share in Slovenia. In other monitored new EU Member States the governmental sector shares are substantially higher, the highest being in Poland (44.9 % in 2002).



B. Analysis of R&D support from public funds

In accordance with Act No. 130/2002 Coll. on research and development support the Research and Development Council compiles, inter alia, the proposals of medium term outlooks for the research and development support and estimates of total R&D expenditures of the individual budget chapters and their distribution. Within performance of this authority the Research and Development Council in co-operation with the Ministry of Finance collects, analyses and interprets data on the medium-term expenditures outlooks and state budgets for respective years.

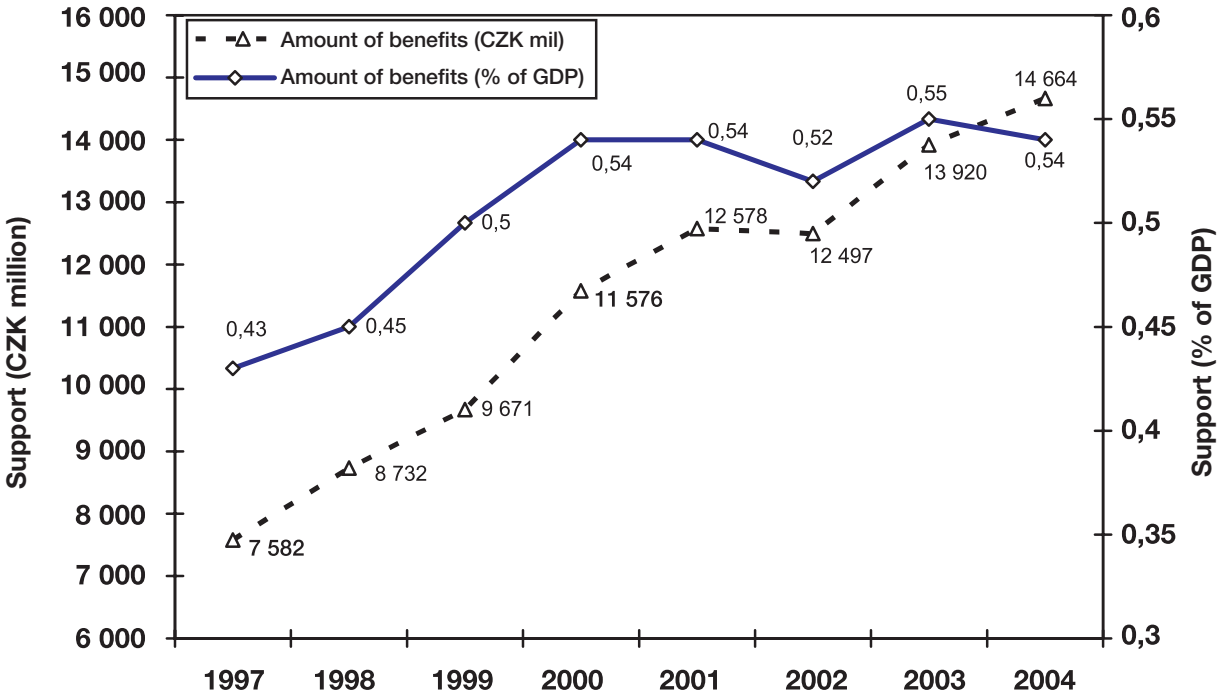
The presented R&D analysis in this Part has the same structure as the R&D analysis approved by the Government in its Resolution No.1167 of November 19, 2003. The evaluated period was advanced by one year, now 1997 – 2004 (the last analysed period was 1996 – 2003). The financial volumes for 2004 are the expected expenditures according to Act on the 2004 State budget. When compared with the 2003 R&D Analysis some values for 2003 were specified according to the additionally made amendments to the 2003 State budget. Other amendments took place after the revision of the GDP amounts for 1995 – 2003 made by the Czech Statistical Office in July 2004.

Data on the R&D public support in this Part slightly differ from information in the previous Part A that are based on data ascertained by enquiries of the Czech Statistical Office (CSO), while the source for the Part B data is the State Budget and medium-term outlooks. Differences between data of the statistical bureaus and ministries of finance occur in most of the countries. As in 2003, four graphs have been included in the analysis this year:

- Trend of state R&D expenditures (CZK mil and % of GDP)
- Trend of state subsidies extended to research and development in some selected departments (CZK mil)
- Trend of institutional support extended to research in selected departments (CZK mil)
- Trend of targeted support to research and development in selected departments (CZK mil)

As in the last year, the group of selected providers includes: Academy of Sciences of the Czech Republic, Grant Agency of the Czech Republic, Ministry of Industry and Trade (MPO), Ministry of Education, Youth and Sports (MŠMT), Ministry of Health (MZ), Ministry of Agriculture (MZe), and Ministry of Environment (MŽP).

B.1 Trend of state R&D expenditures (CZK mil and % of GDP)



Source: State budget of the Czech Republic, 1997–2004

Note: The figures referring to % of GDP and state R&D expenditures are based on data published by the Ministry of Finance. The latter differ from data promulgated by the Czech Statistical Office (CSO), employed in Part A of the Analysis. Expenditures in CZK million are reported in current prices of respective years.

Commentary:

(1) Data on R&D support in % of GDP in 1997-2003 differ from data mentioned in Chapter A of the 2003 R&D Analysis. The changes were due to the GDP amounts revision conducted by the Czech Statistical Office (CSO) in July 2004. The GDP values increased against the original values, while the value of R&D support in % of GDP decreased.

(2) The state R&D expenditures expressed in standard indicator % of GDP were rising till 2000; between 1998 and 2000 their rise was a relatively dynamic one. In 2000 they reached 0.54 % of GDP. After the fall in 2002 to 0.52 % of GDP, the year 2003 experienced an increase to 0.55 %. The original assumption for 2004 – 0.58 % of GDP – was corrected to 0.54 % of GDP after the increase of the expected amount of GDP.

(3) To reach the expenditures of 0.7 % of GDP still remains a far away target despite the fact that the Government has announced repeatedly the attainment of this level in its various documents. The Czech Republic, as well as some other EU Member States, in particular those who acceded EU in 2004, will not be able to achieve by 2010 the target set on the 2002 Spring European Council Meeting in Barcelona: overall R&D expenditures in the level of 3 % of GDP, of this 1 % from public funds and 2 % from private (corporate) funds. The stagnation in 2001 and fall in 2002 were the result of the fact that the Government and individual departments started, as their budgetary priorities, to give preference to settlement of actual problems to creation of conditions for the economic growth in the future.

(4) If we evaluate the state R&D support by the expenditures growth in real amounts and in current prices, the situation looks much more favourable.

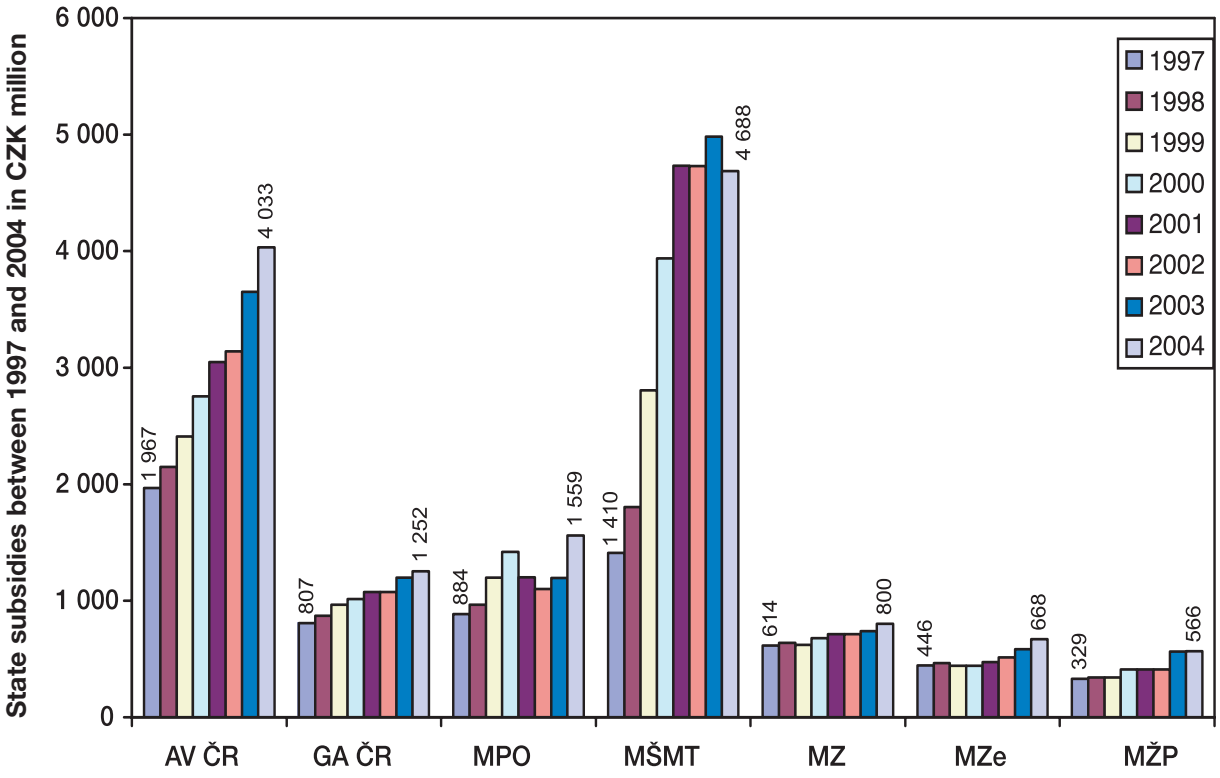
The growth of the state R&D expenditures (in % of expenditures of the preceding year)

1998	1999	2000	2001	2002	2003	2004
15,1	10,9	27,6	8,7	-6,4	11,4	5,3

(5) With the exception of 2002, when the significant decline in comparison with the preceding year took place, in all other monitored years the expenditures experienced a dynamic growth, even in 2004 with the growth of 5.3 % against 2003. The increments are higher than in many other EU countries, even the countries of the former EU-15. In the Czech Republic the dynamics of the state R&D expenditures growth is higher than the dynamics of the GDP growth in the monitored period.

(6) The preparation documents on the draft 2005 State Budget and 2006 and 2007 Outlooks envisage further increase in the R&D expenditures: in 2005 – CZK 16.5 billion (0.57 % of GDP); 2006 – CZK 18.2 billion (0.59 % of GDP); 2007 – CZK 22.4 billion (0.68 % of GDP). The details on the support in % of GDP respect the more favourable estimates of the GDP amounts according to the Ministry of Finance from September 2004.

B.2 Trend of state subsidies extended to research and development in some selected departments (CZK million)



Source: State budget of the Czech Republic, 1997–2004

Note: AV ČR – Academy of Sciences of the Czech Republic, GA ČR – Grant Agency of the Czech Republic, MPO – Ministry of Industry and Trade, MŠMT – Ministry of Education, Youth and Sports, MZ – Ministry of Health, MZe – Ministry of Agriculture, MŽP – Ministry of Environment. Expenditures in CZK million are reported in current prices of respective years.

Commentary:

(1) The R&D expenditures were increasing in all departments over the monitored period. The largest growth was experienced by MŠMT and AV ČR.

The growth of R&D expenditures in selected departments (in % of 1997 expenditures)

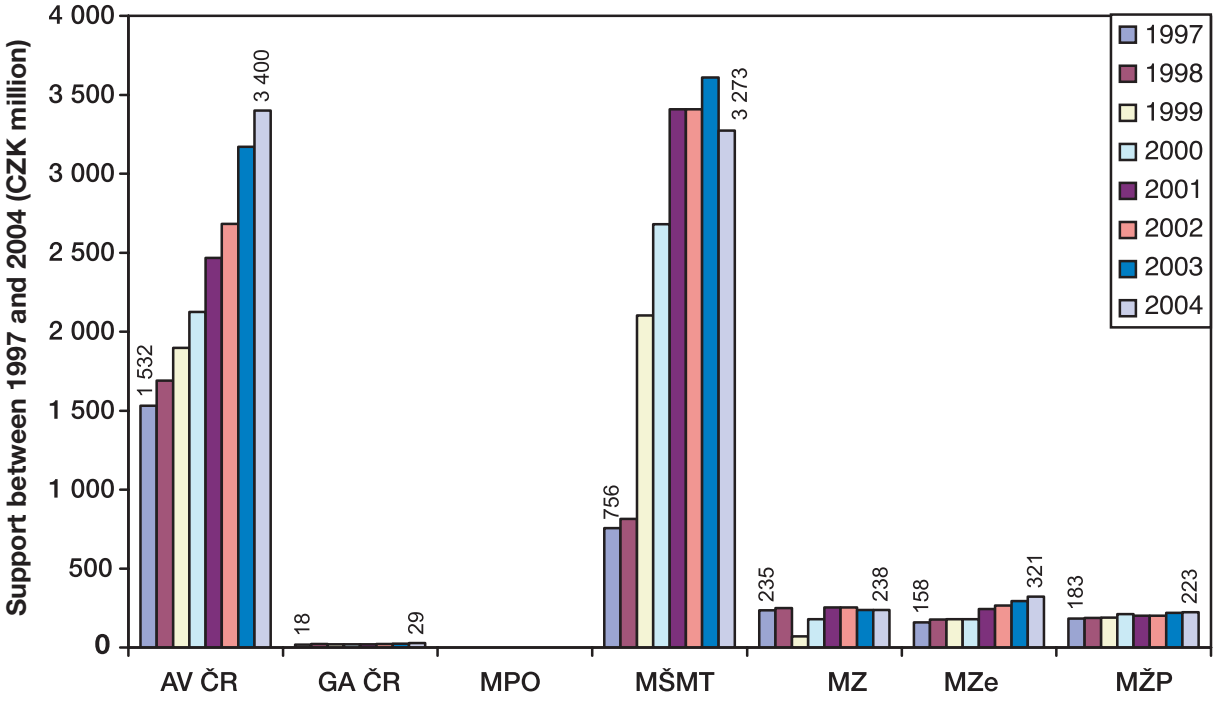
AV ČR	GA ČR	MPO	MŠMT	MZ	MZe	MŽP
105,0	55,1	76,4	232,5	30,3	49,8	72,0

The dynamic growth in R&D expenditures of MŠMT was experienced in the period from 1997 to 2001 in compliance with set priorities of the R&D support, and then the amount of support stagnated. In 2004 the expenditures of MŠMT declined because the previous payment of charges for participation in the 6th EU Framework Programme for Research and Development (6FP) passed over from MŠMT to the Ministry of Foreign Affairs.

(2) The dynamic and relatively even growth is experienced by the expenditures of AV ČR. The lowest annual growth (3.4 %) was in 2002, in the year when most of the providers reduced their expenditures. The largest growth was attained in 2003 – 16.3 % against the 2002 expenditures. In both mentioned years the growth covered mostly the increase in salaries requested by law.

(3) After their decline and certain stagnation between 2001 and 2003 the R&D expenditures of MPO increased in 2004 to CZK 1.559 billion. Even though the industrial research is funded also from budgetary chapters of other providers, its support is still insufficient.

B.3 Trend of institutional support extended to research in selected departments (CZK million)



Source: State budget of the Czech Republic, 1997–2004

Note: AV ČR – Academy of Sciences of the Czech Republic, GA ČR – Grant Agency of the Czech Republic, MPO – Ministry of Industry and Trade, MŠMT – Ministry of Education, Youth and Sports, MZ – Ministry of Health, MZe – Ministry of Agriculture, MŽP – Ministry of Environment. Expenditures in CZK million are reported in current prices of respective years

Commentary:

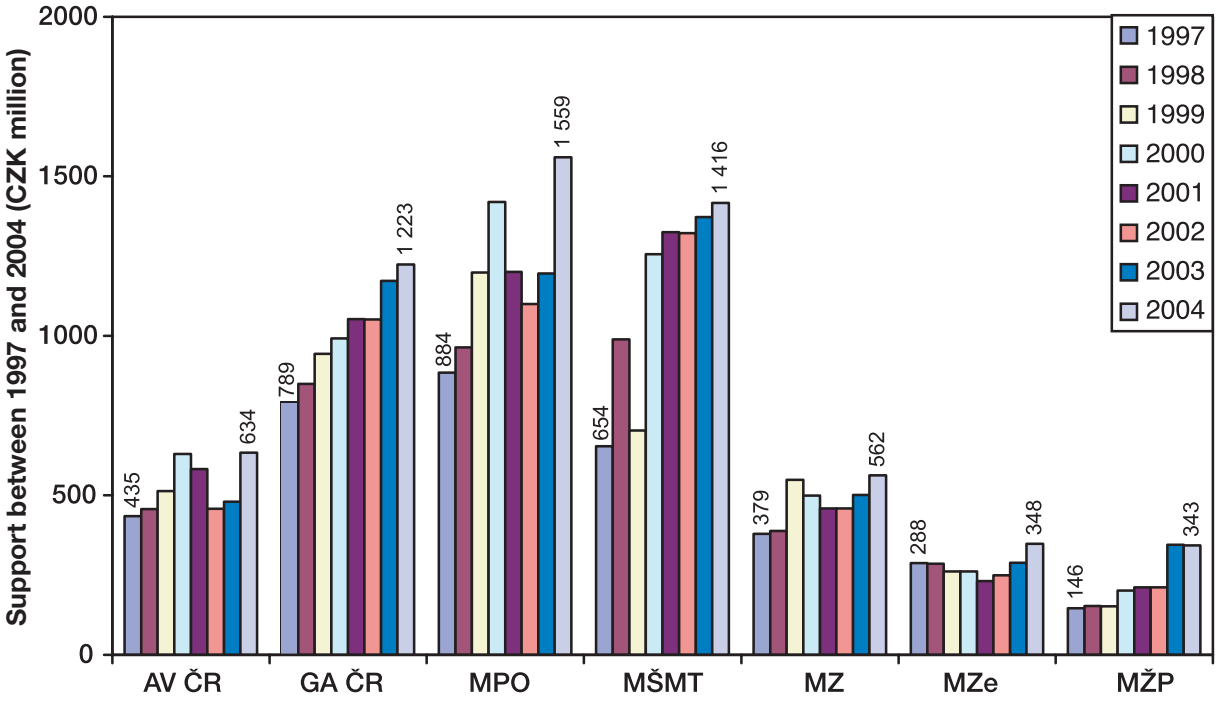
(1) The institutional support of research until 1998 had acquired the form of a subsidy to contributory and budgetary R&D organisations of particular providers. Since 1999 this support has been provided based on the research plans. With MŠMT this institutional support has another three forms: specific research on universities, research plans of private entities (see also point 4 of the Commentary) and support to certain activities of the international co-operation. Most of the research plans were prolonged till 2004. Significant changes are envisaged from 2005 with launching of new research plans.

(2) In principle, the amount of the institutional support after 1999 is predetermined by the approved research plans. The changes, with the exception of AV ČR and MŠMT, are very minor.

(3) MPO has no "departmental" research organisation and provides no institutional support to research and development. The institutional resources of GA ČR are intended for provision of its administrative cost.

(4) Starting from 2004 it is possible to provide the institutional support under certain terms to private entities as well. This support is provided by MŠMT. Despite this MŠMT experienced the decline in the overall institutional support in 2004. The reason is that the payment of charges for participation in the 6FP passed over from MŠMT to the Ministry of Foreign Affairs (see also the Commentary to Graph B.2).

B.4. Trend of targeted support to research and development in selected departments (CZK million)



Source: State budget of the Czech Republic, 1997–2004

Note: AV ČR – Academy of Sciences of the Czech Republic, GA ČR – Grant Agency of the Czech Republic, MPO – Ministry of Industry and Trade, MŠMT – Ministry of Education, Youth and Sports, MZ – Ministry of Health, MZe – Ministry of Agriculture, MŽP – Ministry of Environment. Expenditures in CZK million are reported in current prices of respective years.

Commentary:

(1) Targeted support of research and development is extended to R&D projects on the basis of the public tender results and public contracts in research and development. GA ČR and AV ČR provide support to grant projects. Other providers, including AV ČR, support projects that are part of their announced R&D programmes.

(2) The annual targeted support of research and development from the AV ČR funds moves in the respective years of the monitored period in the range of ca CZK 450–650 million. The decisive part of these funds is provided by AV ČR in the form of an institutional support.

(3) The targeted support of other providers grows by somewhat slower pace than is the pace of growth in the overall research and development support from public funds.

C. Analysis of R&D information system data (R&D IS)

The research and development information system (R&D IS) is administered by the Research and Development Council and operated by the Office of the Czech Republic Government. The scope of data supplied to R&D IS, the purpose of R&D IS and other basic requirements are stipulated by Act No. 130/2002 Coll. on research and development support and Decree of the Government No. 267/2002 on the research and development information system.

The R&D IS data base integrates four information areas: "Central register of R&D projects" (CEP), "Central register of research intentions" (CEZ), "Information register of R&D results" (RIV) and "Register of public tenders in R&D" (VES).

This part of R&D analysis has the same structure as the corresponding part of the analysis submitted to the Government in 2003. Data valid for 2003 were added (for CEP, CEZ and RIV) and the monitored period for CEP and CEZ was advanced by one year (now 2001–2003). Some data of CEP and CEZ slightly differ from the last analysis data. The reason for varying data within the same monitored year is the additional modification of data in some departments and correction of certain discrepancies in supplied data discovered in some departments during the R&D IS data base audit as provided by law. The graphs with related commentaries analyse the main parameters of two basic forms of R&D support in the Czech Republic, i.e. targeted support of R&D projects and institutional support of R&D on universities, institutes of the Academy of Sciences of the Czech Republic and research institutes of the departmental ministries.

This part of analysis contains 10 graphs:

- Number of R&D projects classified by sector between 2001 and 2003
- R&D projects classified by sector between 2001 and 2003 pursuant to the amount of funds
- Number of R&D projects pursuant to the amount of targeted support between 2001–2003
- Number of R&D projects pursuant to the age of principal investigators between 2001–2003
- Number of research plans classified by sector between 2001 and 2003
- Research plans classified by sector between 2001 and 2003 pursuant to the amount of funds
- Number of research plans pursuant to the amount of institutional support between 2001 and 2003
- Number of research plans pursuant to the age of principal investigators between 2001 and 2003
- Number of R&D results registered between 1998 and 2003, classified pursuant to the type of a result
- Number of R&D results registered between 1998 and 2003, classified pursuant to the categories of recipients and type of a result

During ten years of the R&D IS existence data on all important aspects of the state support extended to research and development have been collected; from the primary registration of projects (CEP) since 1993 when the grant system of project funding was launched, through the first steps in the collection of publications (RIP) in 1995, first granting of research plans in 1998 connected with their registration (CEZ), development of collection of results in the information area (RIV) since

1998, registration of public tenders in research and development (VES) since 2000 to the registration and processing of grounds for the draft R&D state budget (State budget – data supplied into R&D IS data base up to 2003).

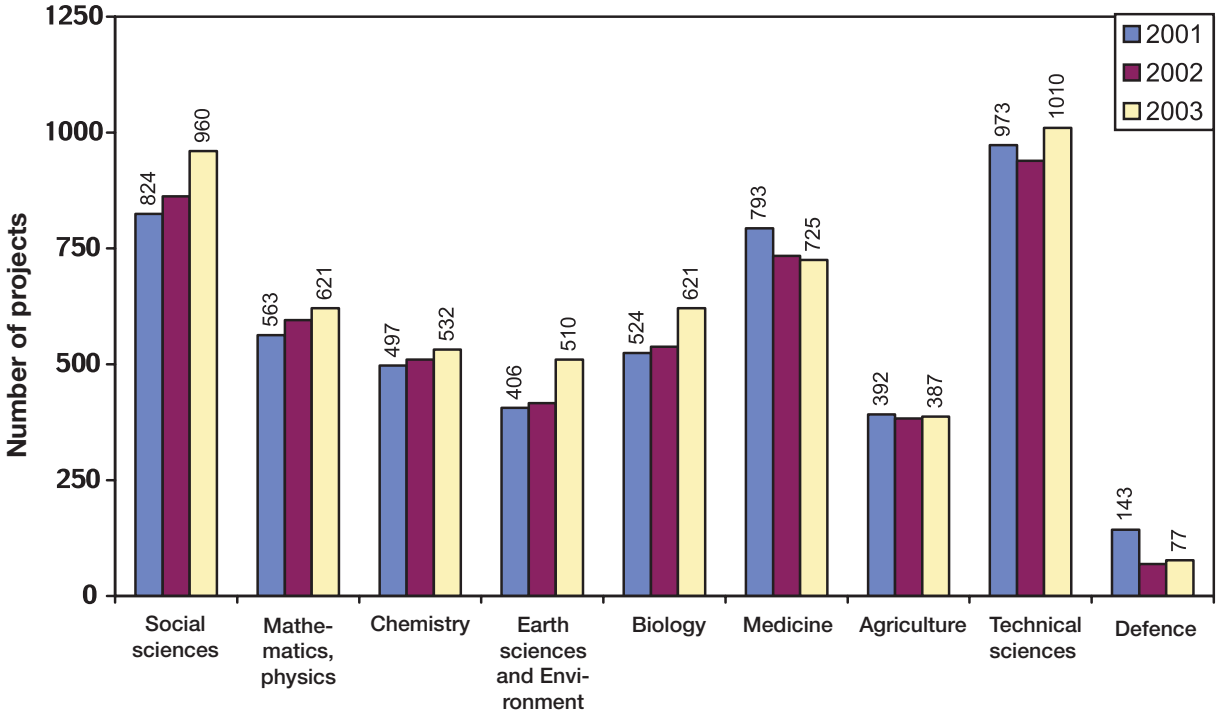
The unavoidable and natural exchange of data structures (34 different data structures in total) was taking place, during which the integration of new data with the historical ones was always made without interrupting the operations of R&D IS.

Supporting registers have been maintained continuously, e.g. the register of subjects active in research and development or the register of activities (programmes and grants), including the history. The collection of data has not been interrupted and now this data complex makes up the genuine information richness.

There exist strong links between the individual information areas and only by employing them a complex and true picture of the state R&D support can be drawn. The existing information system was reconstructed in 2001 in order to use the potential of links between the information areas. Since 2004 CEP, CEZ and RIV data will be used, inter alia, as a basic source of information in the prepared system of R&D evaluation approved by the Government by its Resolution No.644 of June 23, 2004. The evaluation methodology in accordance with this system was given to the departments in October 2004; the outputs from R&D IS in the first phase of the R&D institutions effectiveness evaluation will be prepared by November 30, 2004.

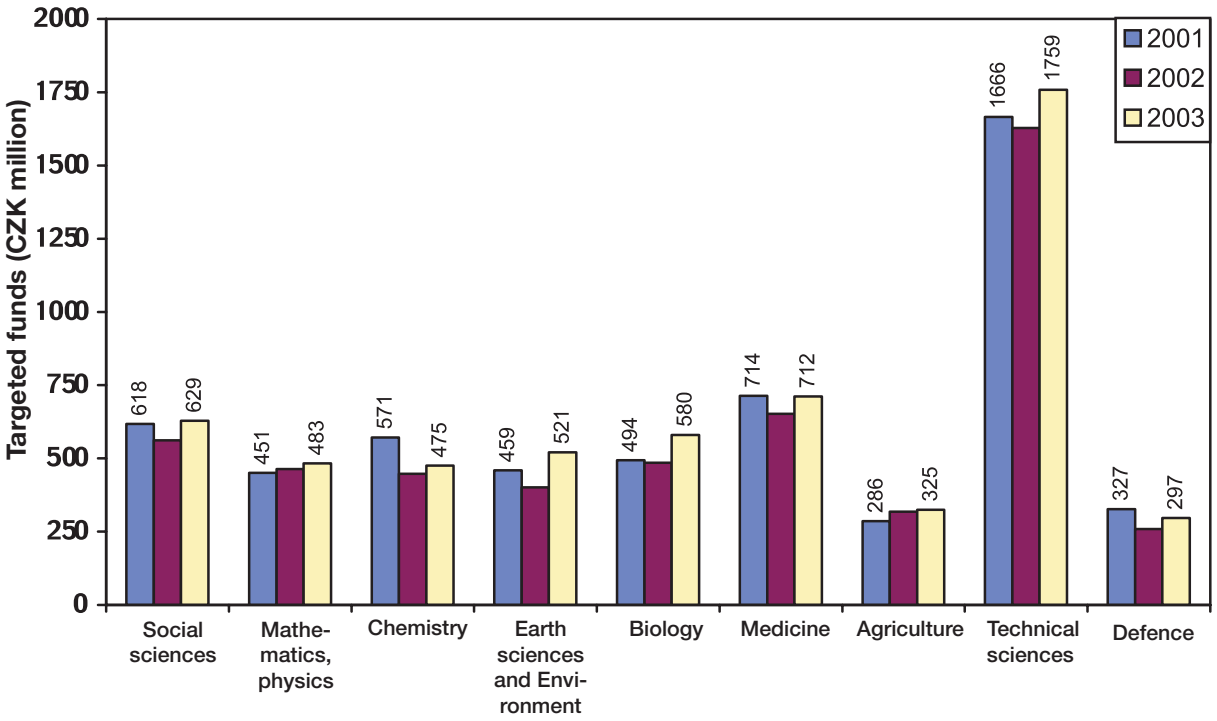
The Research and Development Council is going to publish more detailed annual scoreboards (R&D IS Yearbooks) starting from 2005.

C.1 Number of R&D projects classified by sector between 2001 and 2003



Source: R&D IS, Central Register of R&D Projects (CEP)

C.2 R&D projects classified by sector between 2001 and 2003 pursuant to the amount of funds



Source: R&D IS, Central Register of R&D Projects (CEP)

Commentary:

(1) The Graphs C.1 a C.2 make possible to form an idea on the trend of the average expenditures (cost) per one R&D project and compare it with the EU trends. In the last years the efforts are manifested in EU and in many EU Member States to increase the size of R&D projects and create the so called critical amount of capacities (both human and financial resources).

(2) With the exception of medicine and defence the number of R&D projects has been slightly increasing, or stagnating respectively (agriculture). Six sectors experienced a moderate growth in project expenditures (cost) between 2001 and 2003, while the chemistry and defence experienced a decrease.

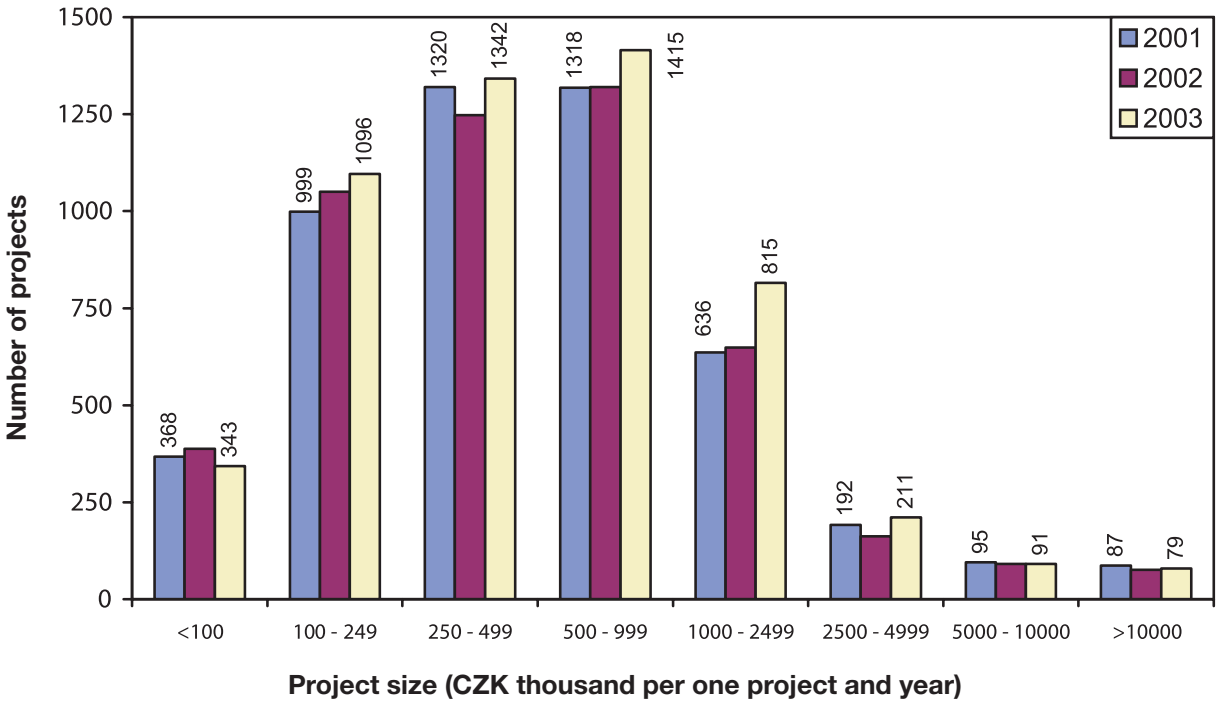
(3) The following table depicts the average expenditures (cost) on R&D projects in CZK million between 2001 and 2003.

Sector	2001	2003
Social sciences	0,750	0,655
Mathematics, physics	0,801	0,778
Chemistry	1,141	0,893
Earth sciences and environment	1,130	1,021
Biology	0,943	0,934
Medicine	0,900	0,982
Agriculture	0,726	0,840
Technical sciences	1,712	1,739
Defence	2,287	3,857

(4) In five out of nine sectors the average project expenditures (cost) decreased, in chemistry this decrease was a relatively substantial one (nearly CZK 0.250 mil). With four sectors there is a slight increase, a substantial one only in defence. In 2003 the average project expenditures (cost) in seven sectors were lower than CZK 1 million per project, in Earth sciences and Environment only a little higher than CZK 1 mil. Only in technical sciences and defence projects the average expenditures (cost) exceeded the level of CZK 1 mil. per project in a more considerable way.

(5) With the exception of social sciences in all other sectors the average size of projects can be qualified as small. The projects do not prepare conditions for creation of necessary critical amount of capacities (human and financial resources). The projects being too small still mean an extraordinary burden both for the research workers preparing the draft projects and working out opinions to draft projects of other submitters, and for the state administration evaluating and selecting the projects, concluding project contracts and evaluating its results.

C.3 Number of R&D projects pursuant to the amount of targeted support between 2001 and 2003



Commentary:

(1) This Graph C.3 confirms the conclusions made in the commentary on the previous Graphs C.1 and C.2. The number of projects in categories up to CZK 1 million per project increased. The numbers of projects larger than CZK 2.5 million per project in principle stagnate; the number of projects in the category up to CZK 5 million slightly increased and numbers of projects in other two categories slightly decreased.

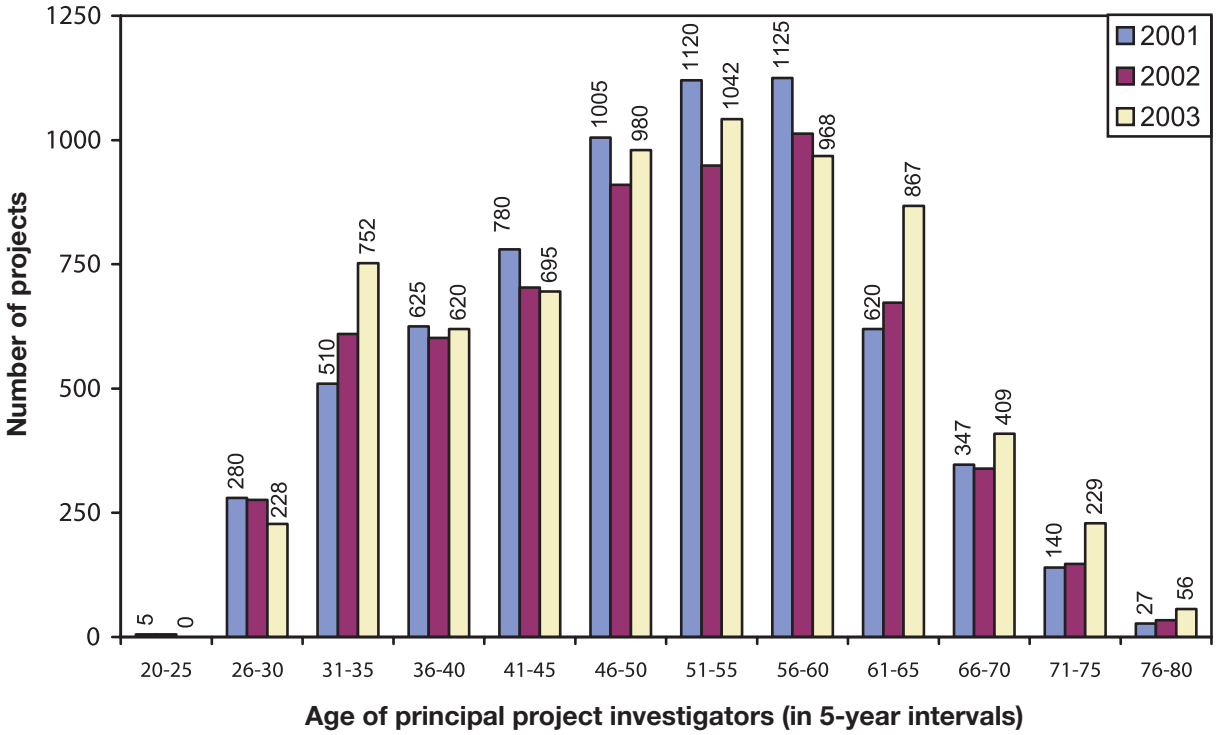
(2) The number of projects with expenditures (cost) under CZK 100 thousand per project moderately decreases, but still remains very high, 343 projects in 2003. Special programmes of support to young research projects announced and coordinated by GA ČR and AV ČR contributed to the maintenance of such relatively high number of projects.

(3) In 2001 the share of projects with expenditures (cost) lower than CZK 1 million per project amounted to 77.8 % out of the total number 5 392 projects. In 2003 this share increased to nearly 80 % out of 5 007 projects in total.

(4) In general, it can be put that the targeted support of research and development in the Czech Republic is fragmented into a too large number of small R&D projects. Such fragmentation of support is one of the main causes of the high administrative demands of the targeted R&D support and obviously one of the possible causes of the limited scope of top quality R&D results applicable in practice.

Source: R&D IS, Central Register of R&D Projects (CEP)

C.4 Number of R&D projects pursuant to the age of principal investigators between 2001 and 2003



Commentary:

(1) The basically one-peak curve of the average age of principal investigators in 2002 with maximum of 1 013 projects lead by investigators between 56 and 60 years changed into a two-peak curve.

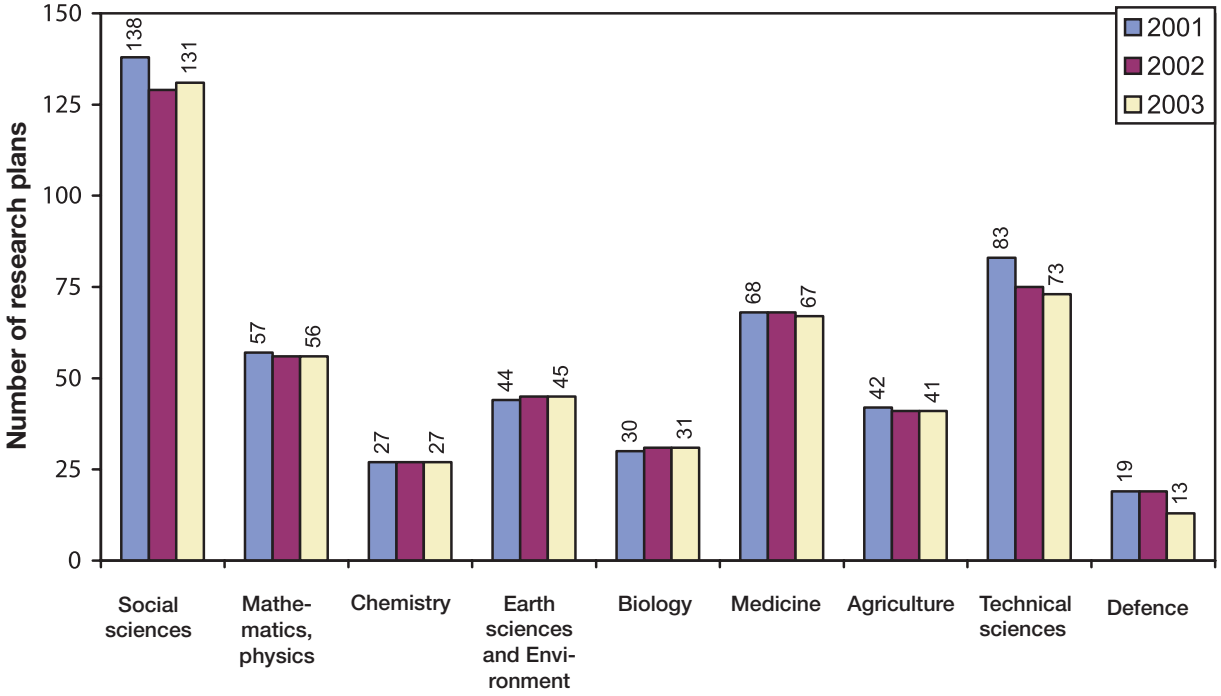
(2) The gratifying increase in the number of projects with the age of a principal investigator in the category between 31 and 35 years is yet accompanied by even more significant growth in the number of projects lead by investigators in the age category of 61 – 65 years and growth also in all three higher age categories.

(3) In the 2003 R&D Analysis the commentary to the graph of the number of projects pursuant to the age categories mentioned with caution that "it is premature to derive any conclusions from the favourable changes in 2002 against 2001". The changes in 2003 only confirm the eligibility of such reserve.

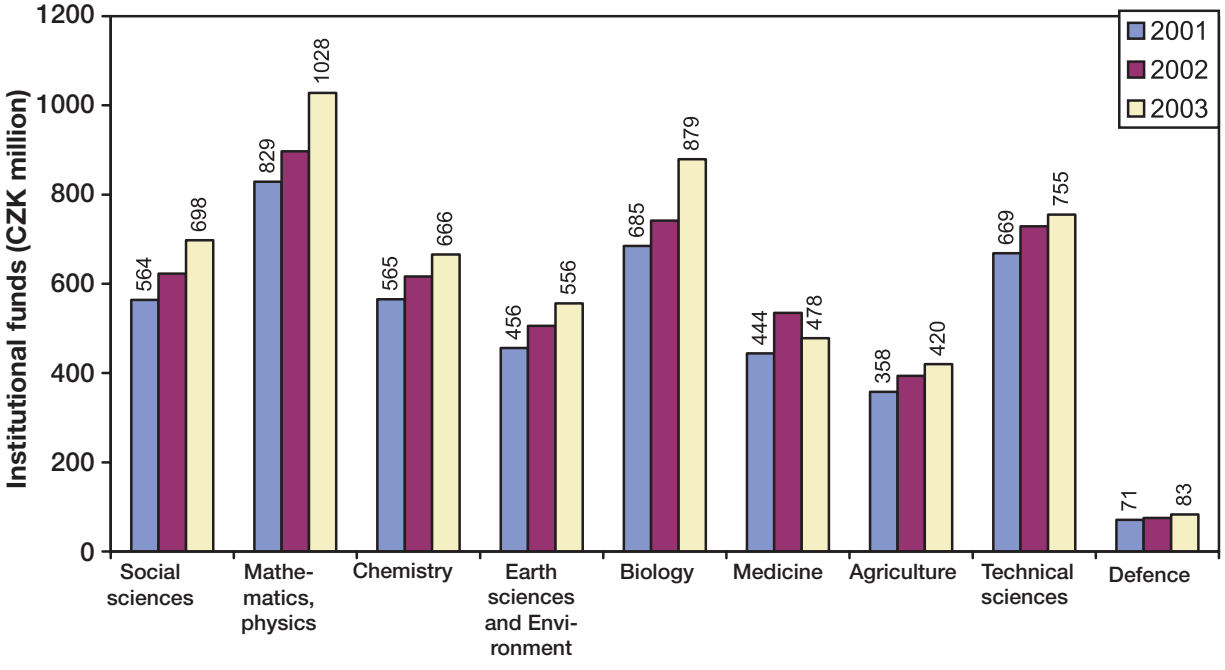
(4) The age structure of the research base is not developing well. The situation is more serious if we take notice of the size of projects being analysed in the previous Graph C.3. The R&D projects with the average expenditures (cost) up to CZK 1 million per project, i.e. in general projects for very small teams, do not need to be lead by senior research workers. Even for the future, the age structure improvement remains one of the most serious tasks of the National Research and Development Policy in the Czech Republic.

Source: R&D IS, Central Register of Research and Development Projects (CEP)

C.5 Number of research plans classified by sector between 2001 and 2003



C.6 Research plans classified by sector between 2001 and 2003 pursuant to the amount of institutional support



Source: R&D IS, Central Register of Research Plans (CEI)

Commentary:

(1) As far as the number of research plans is concerned no marked changes occurred in this field. Basically all research plans started in 1999 continued their work. Some departments additionally specified the data on the number of research plans. Some details moderately differ from data referred to in the 2003 R&D Analysis. Any marked turns cannot be expected until 2005, because solution of most of the plans started in 1999 will continue even in 2004.

(2) The more considerable increase in the institutional support to the plans in sectors like mathematics and physics, biology, as well as social sciences complies with the approved progressive rise in the expenditures (cost) on other solution.

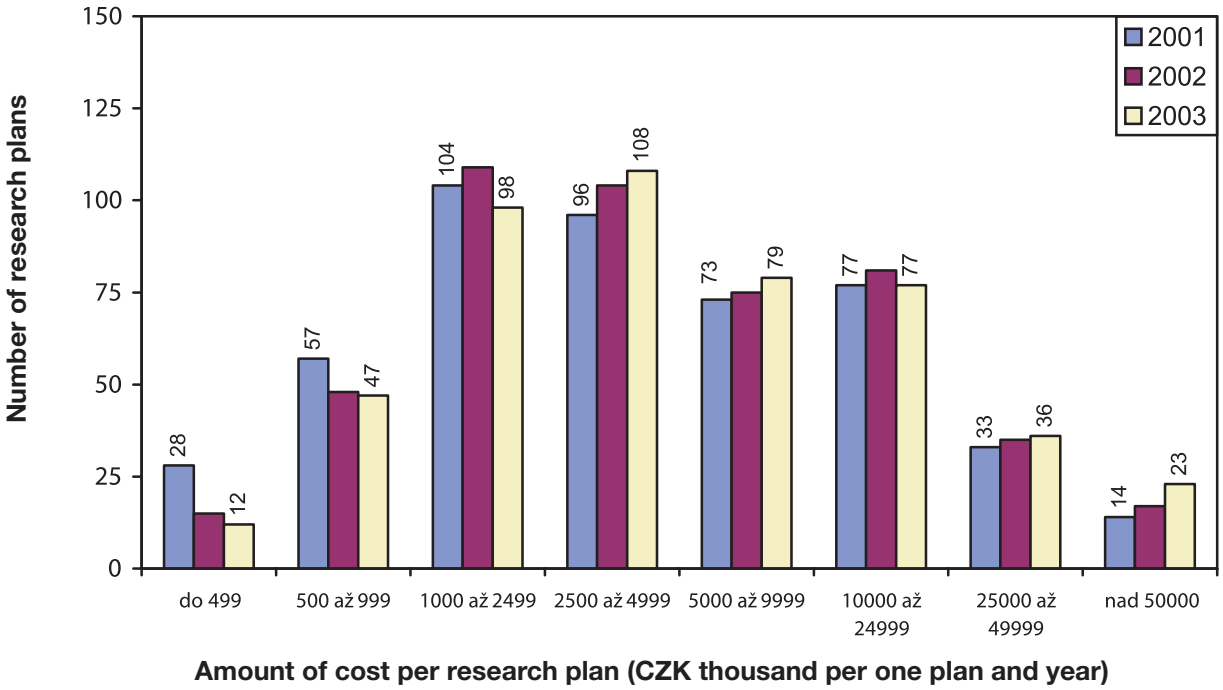
(3) The following table depicts the average cost of research plans in CZK million between 2001 and 2003.

The increased average cost of research plans in 2003 against 2001 corresponds with the approved support growth

Sector	2001	2003
Social sciences	4,1	5,3
Mathematics, Physics	14,5	18,4
Chemistry	20,9	24,7
Earth sciences and Environment	10,4	12,4
Biology	22,8	28,4
Medicine	6,5	7,1
Agriculture	8,5	10,2
Technical sciences	8,1	10,3
Defence	3,7	6,4

(4) Naturally, the individual evaluated sectors have different demands on apparatuses, equipment, consumption material, etc. and it is not possible to determine any single optimum amount of annual expenditures (cost) per plan. Nevertheless it can be put that in five monitored sectors the average expenditures (cost) per research plan were lower than CZK 10 million per plan or exceeded this limit only slightly. These plans can be marked as small, and with the exception of social sciences it is justified to believe that within their frameworks no critical amounts of capacities (financial and human resources, etc.) were created needful for quick and effective attainment of any meaningful results. In 2003, the average value of CZK 20 mil per one plan was exceeded only by chemistry and biology. When compared with abroad a considerable part of research plans in the Czech Republic reaches as far as the amount of financial support is concerned the size of larger R&D projects.

C.7 Number of research plans pursuant to the amount of institutional support between 2001 and 2003



Source: R&D IS, Central Register of Research Intentions (CEZ)

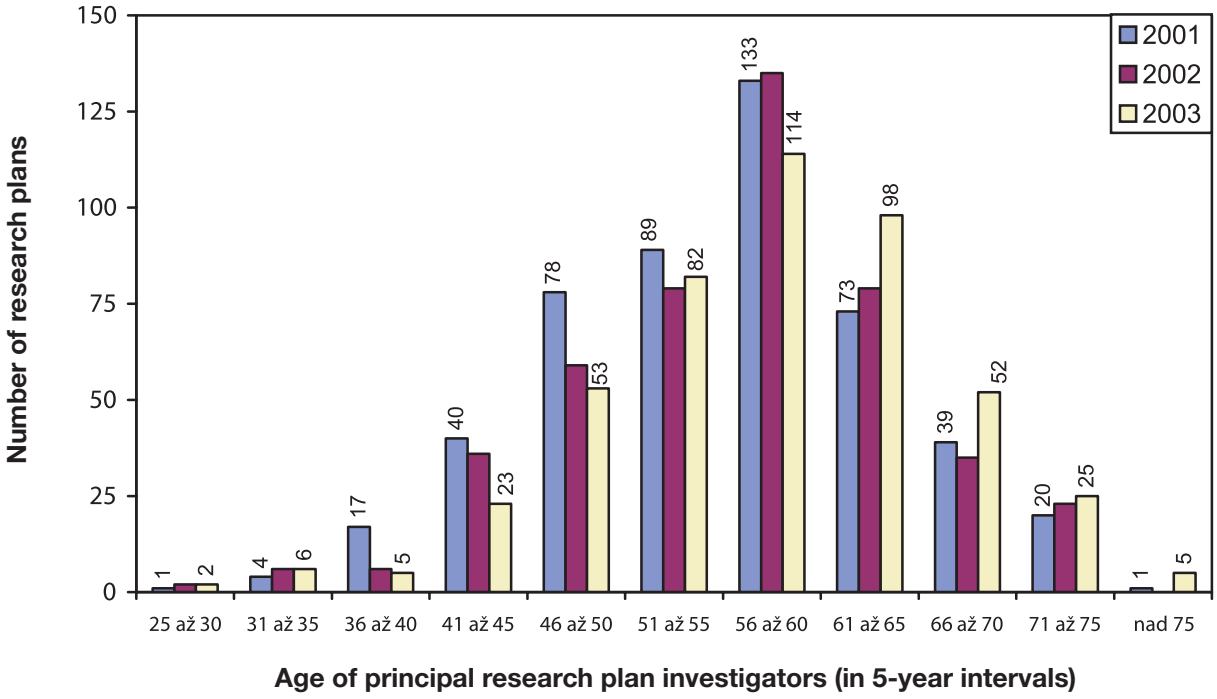
Commentary:

(1) The graph confirms the data in Graphs C.5 and C.6 with possible conclusions that the numbers of research plans decline while their cost rise. The numbers of research plans with cost up to CZK 2.5 mil per plan were slightly decreasing between 2001 and 2003 and numbers of plans with higher cost were rather increasing. As already mentioned before, both declines and rises are given by the amount of approved funds for research plans being planned for respective years.

(2) In 2003, the share of research plans with cost up to CZK 5 mil per plan amounted to 55.2 % out of the total number of 480 research plans. In the same year the share of research plans with cost up to CZK 10 mil per plan amounted to 71.7 %.

(3) It is evidently justified to say that the institutional support to research and development is from a considerable part fragmented into research plans of low cost with all the negative impacts of such fragmentation (insufficient concentration of resources, high administrative and control demands).

C.8 Number of research plans pursuant to the age of principal investigators between 2001 and 2003



Source: R&D IS, Central Register of Research Intentions (CEZ)

Commentary:

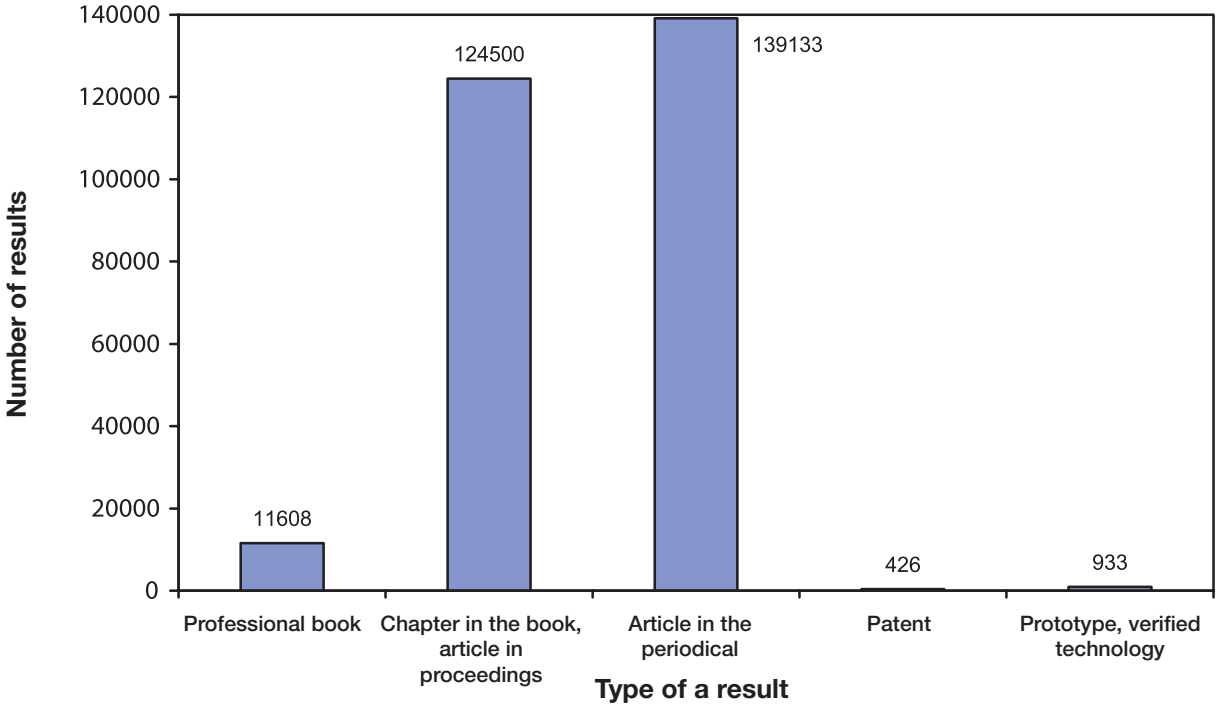
(1) Rather considerable changes seemingly take place in certain age categories; e.g. decrease in the number of principal investigators in the category 56 to 60 years and increase in the category 61 to 65 years. But it is the result only of natural aging, because the replacements in the person of principal investigator of a research plan are not too frequent.

(2) The age structure of principal investigators of research plans confirms the conclusion on the alarming pace of the scientific and research base aging mentioned in the commentary to the Graph C.4. In 2003, the numbers of principal investigators in the age categories 41 to 45 years, 46 to 50 years and 56 to 60 years declined when compared with 2002, whereas in categories 61 to 65 years and older they rised. The main reason for these changes is the natural aging as mentioned before.

(3) Out of the total number of 465 principal investigators in 2003 only 7.7 % (36 principal investigators) were younger than 46 years, or 19.1 % (89 principal investigators) younger than 51 years respectively. On the contrary, nearly 39 % of principal investigators were older than 60 years.

(4) To manage a research plan as a principal investigator naturally requires more experience than the management of R&D projects. Therefore it is not surprising that most of the principal investigators of research plans find themselves in the age category 56 to 60 years, while for R&D projects it is in the category 51 to 55 years.

C.9 Number of R&D results registered between 1998 and 2003, classified pursuant to the type of a result



Source: R&D IS, Information Register of R&D Results (RIV)

Commentary:

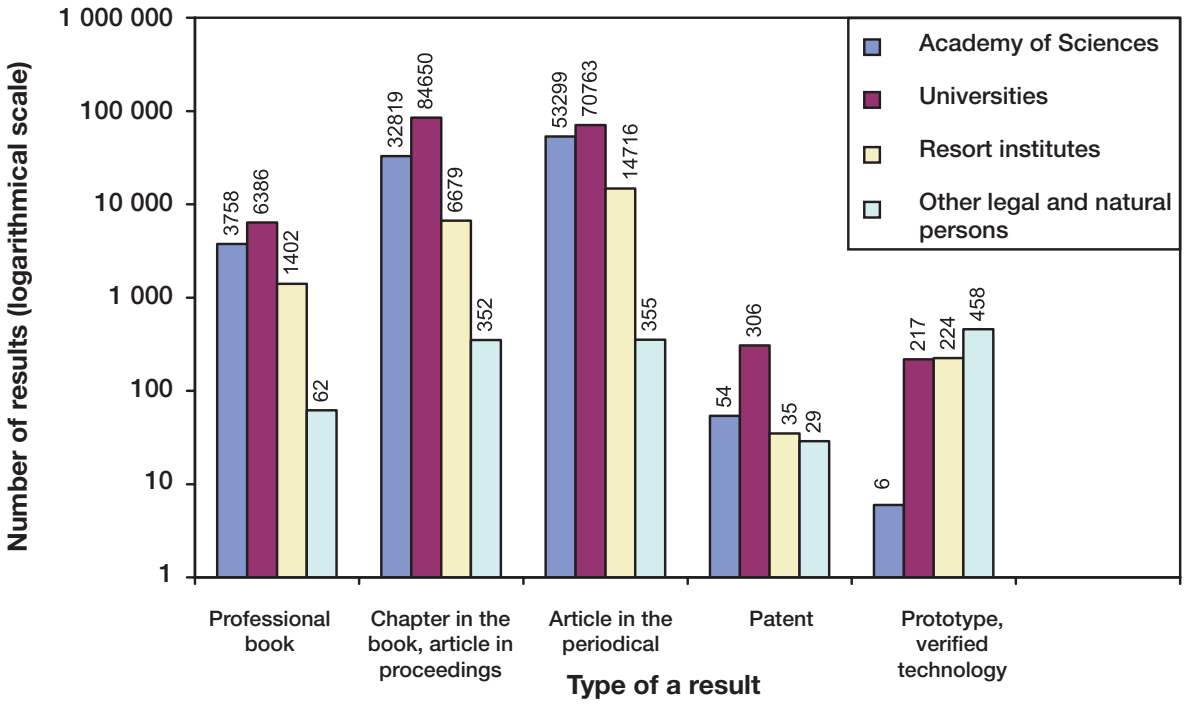
(1) The graph columns depict the sums of registered results of all R&D projects and research plans between 1998 and 2003 in following categories of results: professional books (monographs, etc.), chapters in professional books and articles in proceedings, articles in professional periodicals, invention applications (patents), prototypes, and verified technologies. The graph does not mention two other categories being registered in the RIV register: presentation activities and research reports – registered in case of results of projects awarded as public contracts under Act No. 199/1994 Coll., as subsequently amended, and commenced through 2002. The numbers of results are given in thousands.

(2) The 2003 R&D Analysis mentioned the results from the period between 2000 and 2002. The presented analysis evaluates a longer period, between 1998 and 2003, and the former category "Chapter in the book" was enlarged by articles (chapters, contributions) in non-periodical proceedings, e.g. conferential.

(3) The publication results significantly dominate: articles in periodicals and chapters in professional books or proceedings. The number of patents, prototypes and verified technologies is absolutely insufficient.

(4) The needful change is expected as a result of the new system of research and development evaluation approved by the Government in its Resolution No.644 of June 23, 2004. The amount of the extended support will depend more on the quality of accomplished results. In addition, a separate evaluation will be applied towards articles in the so called impact periodicals being monitored and evaluated by the internationally renowned company Thomson ISI, USA. Only as an exception the articles in reviewed, but non-impact periodicals will be included in the evaluation – "with a lower mark". The number of these periodicals will be, however, significantly limited.

C.10 Number of R&D results registered between 1998 and 2003, classified pursuant to the categories of recipients and type of a result



Source: R&D IS, Information Register of R&D Results (RIV)

Commentary:

(1) This graph, the vertical axis of which applies a logarithmical scale, analyses data depicted in the previous Graph C.9 in more details. Again it refers to the total number of results registered between 1998 and 2003. The numbers of patents, verified prototypes and technologies are very low. The results are given separately for each of the main categories of the public support recipients: Academy of the Sciences of the Czech Republic, universities, budgetary and contributory organisations, incl. departmental institutes (i.e. institutes of the line ministries) and for other legal and natural persons.

(2) If disregarding the capacities of individual categories of recipients (R&D sectors) then the universities report most results in following groups: professional book; chapter in the professional book or article in proceedings; article in the periodical, patents. Other legal and natural persons (largely the business sector) are the best – which is absolutely logically – in the group "prototypes and verified technology". Surprisingly the most patents are reported by universities.

(3) Somewhat different looks the evaluation when taking notice of the personal capacities of individual R&D sectors. The publication "Research and Development Indicators for 2002 (Code: 9601-03)" of Czech Bureau of Statistics reports following numbers of R&D workers after conversion to the full-time equivalent (FTE):

	2001	2002
Business sector	5 753	6 191
Government sector	4 837	4 429
Universities	4 249	4 283

The government sector includes research workers of the Academy of Sciences of the Czech Republic and departmental research institutes of the state administration agencies. It can be concluded from the annual reports of the Academy of Sciences of the Czech Republic, which report the number of workers with a rather different methodology (conversion to the average annual number of workers) than CSO, that personal capacities of the Academy institutes make up ca 84 % of the government sector capacities which would correspond to ca 3 700 research workers. When converted to one research worker the differences between the efficiency of universities and that of the Academy of Sciences of CR would be lower in all categories of results. Even so universities would keep their primacy[1].

Unsatisfactory is the fact that the category of other legal and physical persons (business sector) reports the least number of patents at high number of the R&D workers. It is necessary to take into account, however, that the information register of results contains only those results being accomplished with the state R&D support.

(4) The Graph C.10 confirms the conclusions about insufficient benefits being brought by research and development to the economy and society in the Czech Republic. The 2004 R&D Analysis will compare the number of individual categories of results to the amount of public funds extended.

1 No simplified conclusions on the performance of resorts in question can be derived from this. Any objective evaluation would also require the evaluation of the quality of publications.

D. Bibliometric analysis of R&D results

Over the last few years the bibliometric analysis, i.e. evaluation of the number of publications and their citations, despite all reservations against its objectivity, methodology and other aspects, has become an integral part of documents evaluating the level of research in the member countries of OECD, as well as in the European Union. In abroad, the development of methodology of the bibliometric evaluation and interpretation of its results comes within the domain of large groups of experts, and frequent conferences and workshops are held on the issue of the bibliometric evaluation. The renowned scientific periodicals in abroad regularly publish the top-tens of research workers in individual scientific disciplines according to the number of their publications or quotations. Published are the lists of top workplaces of individual scientific disciplines.

The most common and used source of data for bibliometric evaluation are information acquired and arranged by the Institute for Science Information – ISI (now Thomson ISI®) in the United States. The Institute monitors and regularly evaluates several thousands of scientific periodicals all over the world. Considering the time, personal, and therefore financial demands the Institute provides information and products for their processing largely against payment.

The approach of the professional public to the bibliometric analysis in the Czech Republic has been and still is rather a reserved one. The reasons of this reserve may be summarised into three blocks:

- a legitimate critical warning of professionals on certain aspects reducing the objectivity of the bibliometry;
- concerns of part of the professional public for the results of the bibliometry not to be misused by some simplified administrative approach to decision-making on the future of research and development in the Czech Republic; and
- other reasons may be briefly characterised as an aversion against any evaluation of successiveness and effectiveness of research and development, any comparisons on the level of countries, institutions, organisations, teams or individuals.

But it can be put that the aversion against bibliometric evaluation is becoming rather weak. The bibliometric evaluation on the level of states was part of analyses submitted to the Government and approved by it in 1999, 2002 and 2003. The representatives of research workplaces from the corporate sphere who were active in the working groups for preparation of the analyses in question are the guarantee that the analyses were made in a professional and objective manner and discovered results were not interpreted in a bureaucratic way.

The presented analysis evaluates:

- Comparison of selected countries and the Czech Republic by relative number of publications included into NSI data bases
- Comparison of selected countries and the Czech Republic by relative number of citations included into NSI data bases
- Comparison of selected countries and the Czech Republic by relative citation index of a country
- Development of the relative citation index of the Czech Republic in 1994–2003
- Comparison of scientific disciplines in the Czech Republic and selected countries by relative citation index of a discipline in 1999–2003
- Development of the relative citation index of disciplines and number of publications in the Czech Republic in 1999–2003

D.1 Comparison of selected countries and the Czech Republic by relative publications production (annual average 1999–2003)

DENMARK	1,49
FINLAND	1,44
THE NETHERLANDS	1,24
UNITED KINGDOM	1,18
USA	1,00
AUSTRIA	0,91
FRANCE	0,83
GERMANY	0,80
EU-15	0,74
SLOVENIA	0,73
JAPAN	0,57
GREECE	0,50
CZECH REPUBLIC	0,42
HUNGARY	0,39
SLOVAKIA	0,34
POLAND	0,26

Source: Thomson ISI® National Science Indicators (NSI), version 1.5 – Standard, Philadelphia USA, 2003
Definition: RPP stands as abbreviation for indicator of the relative publications production indicating the number of publications produced by the research of a particular country per 1 000 inhabitants of that country.
Note: Detailed definition of indicators and the evaluation methodology are available at www.thomson.com/scientific/stientific/jsp

Commentary:

(1) The professional research publications production indicator enables to compare bibliographic outputs of that part of research of a particular country the main result of which is a new knowledge diffused through a professional research publication. These are particularly those parts of research classified in the Manual Frascati (Evaluation of scientific and technological activities, OECD, Paris 2002) as basic research and a portion of the applied research. The indicator of simple publications production discriminates smaller countries having smaller scope of research than the bigger ones. Therefore it is more just to use for comparison of the countries the indicator of *The relative publications production* implementing the correction to the size of each country by conversion to 1 000 inhabitants of that country.

(2) The publications production, however, is a quantitative indicator stating nothing about their quality.

(3) In our case the Czech Republic is compared within the group of 10 selected countries and EU by the RPP indicator. Among those selected are great powers, technologically advanced European countries, countries with highly effective science, technology and innovations, neighbouring countries, and Greece. The average value of this indicator for EU may serve as a comparison standard.

(4) In the monitored year the Czech Republic took last but three place as classified by value of the RPP indicator arranged in the descending order within the group of 15 selected countries and one region, with RPP = 0.42. This is a little more than half the value reported as the EU average (RPP = 0.74). Poland reports a significantly lower value of the RPP indicator.

(5) It is necessary to say that comparisons based on the conversion to 1 000 inhabitants are not absolutely objective in case of more significant differences in the number of research workers, or R&D expenditures respectively. Graphs A.2.1 and A.2.2 in Chapter A show that the Czech Republic has 1.9 times less research workers than is the EU-15 average. If we convert the publications production to the number of research workers then the Czech Republic with its value of RPP = 0.80 moderately outdoes the EU-15 average being RPP = 0.74.

(6) Remarkable are the values of RPP indicator for Denmark, Finland and the Netherlands reaching nearly double the average of the EU countries. These countries have an advanced and fully functional research system that together with a high quality management and effective funding enables the above-average results to be attained not only in the basic and applied researches.

D.2 Comparison of selected countries and the Czech Republic by relative production of citations (annual average 1999–2003)

DENMARK	9,07
FINLAND	7,81
THE NETHERLANDS	7,52
UNITED KINGDOM	6,72
USA	6,59
AUSTRIA	4,57
GERMANY	4,30
FRANCE	4,11
EU-15	3,60
JAPAN	2,35
SLOVENIA	2,04
GREECE	1,52
HUNGARY	1,40
CZECH REPUBLIC	1,25
SLOVAKIA	0,87
POLAND	0,72

Source: Thomson ISI® National Science Indicators (NSI), version 1.5 – Standard, Philadelphia USA, 2003
Definition: RPC stands as abbreviation for indicator of the relative production of citations that indicates the number of citations of those publications that were produced by the research of a particular country per 1 000 inhabitants of that country.
Note: Detailed definition of indicators and the evaluation methodology are available at www.thomson.com/scientific/stientific/jsp

Commentary:

(1) For evaluation of the publication's quality the number of its citations is used that with certain limitations (e.g. it is not possible to compare together the number of citations of publications in different disciplines) speaks about the interest of the scientific community in the given work. Similarly as with the production of publications the indicator of the total production of publications would discriminate small countries and therefore the indicator of relative production of citations is used.

(2) The Czech Republic, Slovakia and Poland close the table of 15 selected countries and EU made in the descending order as classified by value of the RPC indicator. Against 2000 the distance of the Czech Republic from the last two countries increased, but the gap between the Czech Republic and leading countries remains nearly constant.

(3) For this indicator the same methodological reserves apply as towards the relative publications production indicator (item (5) of Commentary to the preceding Graph D.1). When comparing the average of EU-15 and the Czech Republic after conversion to the number of research workers we get the RPC value for the Czech Republic = 2.4. This lagging behind the EU-15 average (RPC = 3.60) is then lower, yet still significant.

(4) The table is headed similarly as with the relative publications production by Denmark, Finland and the Netherlands with the value of the RPC indicator more than double the value of the EU countries average. Austria, France and Germany with very near values of that indicator hold closely above the value of RPC for the EU average.

(5) For the Czech Republic it can be put as to graphs D.1 and D.2, while respecting the number of research workers, that the production of publications in the Czech Republic is a little higher than the EU-15 average. In the production of citations, meaning the quality of publications, the Czech Republic performance is lower than the EU-15 average.

D.3.1 Comparison of selected countries and the Czech Republic by relative citation index of a country (period 1999–2003)

USA	1,46
DENMARK	1,34
THE NETHERLANDS	1,34
UNITED KINGDOM	1,27
FINLAND	1,20
GERMANY	1,19
AUSTRIA	1,12
FRANCE	1,10
EU-15	1,07
JAPAN	0,92
HUNGARY	0,79
GREECE	0,67
CZECH REPUBLIC	0,65
SLOVENIA	0,62
POLAND	0,61
SLOVAKIA	0,56

Source: Thomson ISI® National Science Indicators (NSI), version 1.5 – Standard, Philadelphia USA, 2003

Definition: RCI stands as abbreviation for the relative citation impact of a given country (region) defined as the citation impact of a given country (region) divided by the citation impact of the Thomson ISI world data base (citation register). The citation impact of a given country (region) indicates the average number of citations per a publication produced by the research of a given country (region) in 1999–2003 irrespective of the difference of disciplines. The RCI indicator compares the level of bibliometric quality of publications of a given country (region) with the average level of bibliometric quality of publications of the Thomson ISI world data base set for 1999–2003.
The value of RCI = 1 means that the given country (region) has the same level of bibliometric quality of publications as is the average bibliometric quality of publications of the Thomson ISI data base. RCI > 1 indicates a level being higher than the average, RCI < 1 indicates a level being lower than the average.

Note: Detailed definition of indicators and the evaluation methodology are available at www.thomson.com/scientific/stientific/jsp

Commentary:

(1) To allow for a direct comparison of the bibliometric quality of publications without the necessity of conversion to the number of inhabitants (that brings a certain distortion because of the different share of scientists in individual countries) the most frequently used indicator of relative citation impact is introduced. In this case it is the relative citation impact of a given country (see the definition); the citation impact of a discipline is based upon the same principle (see below).

(2) The Czech Republic followed by Slovenia, Poland and Slovakia closes the group of 15 selected countries and the EU region ranking according to the decreasing value of RCI. The list is headed by the United States having their value of the RCI indicator high above the average, followed by Denmark and the Netherlands. These countries are so different as far as the geography and population are concerned, but what is common to them both is that in many disciplines they are leading countries in the level of the research performance.

(3) In the period 1999–2003, the bibliometric quality of publications and of the basic research in particular, for the countries of EU as a whole approaches the average level of bibliometric quality of all publications irrespective of the difference of disciplines of the world database (the world standard). The Czech Republic arrives only at 65 % of this level, while the Netherlands reports 134 % and the United States 146 % of the world standard.

(4) Other selected advanced countries as the United Kingdom, Finland, Germany, Austria and France report the values of the RCI indicator above the average. A moderately below-average value of the RCI indicator for Japan may be the consequence of the still not completed transformation of the research system of the country.

D.3.2 Development of the relative citation index of the Czech Republic in 1994–2003

Year	RCI CR
1994	0,48
1995	0,54
1996	0,54
1997	0,58
1998	0,58
1999	0,64
2000	0,68
2001	0,72
2002	0,70
2003	0,73

Source: Thomson ISI® National Science Indicators (NSI), version 1.5 – Standard, Philadelphia USA, 2003
Definition: Annual bibliometric quality of publications is expressed by the RCI indicator (for definition of the RCI indicator see Table D.3.1) for publications and their citations produced by the research of the Czech Republic for each given year.
Note: Detailed definition of indicators and the evaluation methodology are available at www.thomson.com/scientific/stientific/jsp

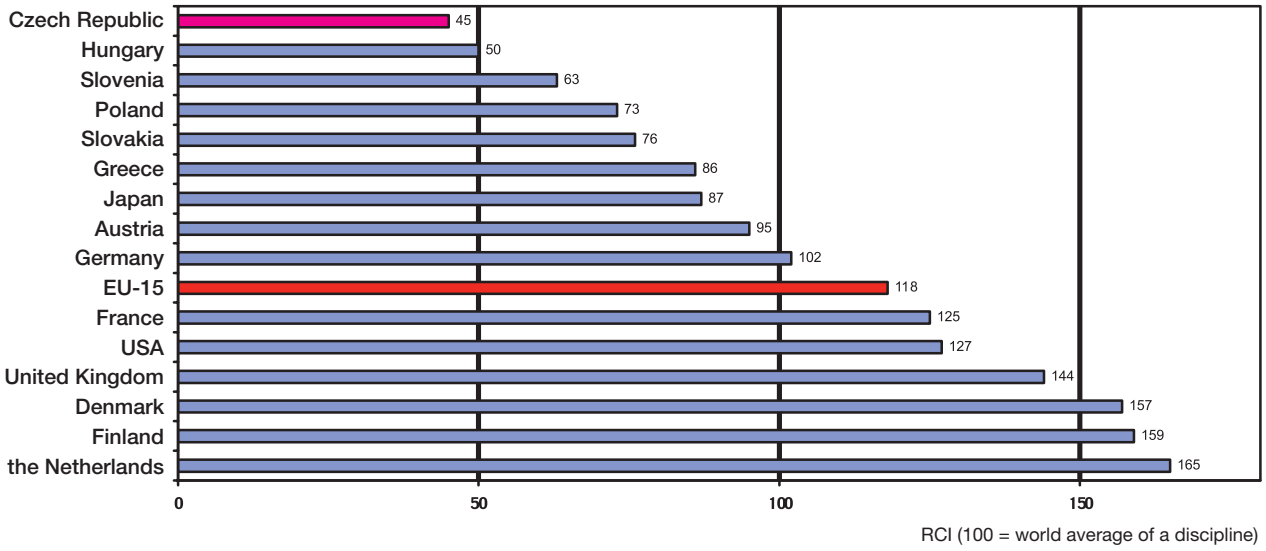
Commentary:

(1) The time dependence of the RCI indicator for the Czech Republic is equal for 1994 to one half of the world standard (state of the Thomson ISI database). Since then the value of RCI for the Czech Republic has been experiencing a steady growth in the year intervals until nowadays (with the exception of 2002) and for 2003 it is equal to 0.73. (This level was reached by Spain and Ireland between 1994 and 1997, see *Analysis of the existing state of research and development in the Czech Republic and a comparison with the situation abroad – 1999*.) This means a positive development particularly in the field of basic research.

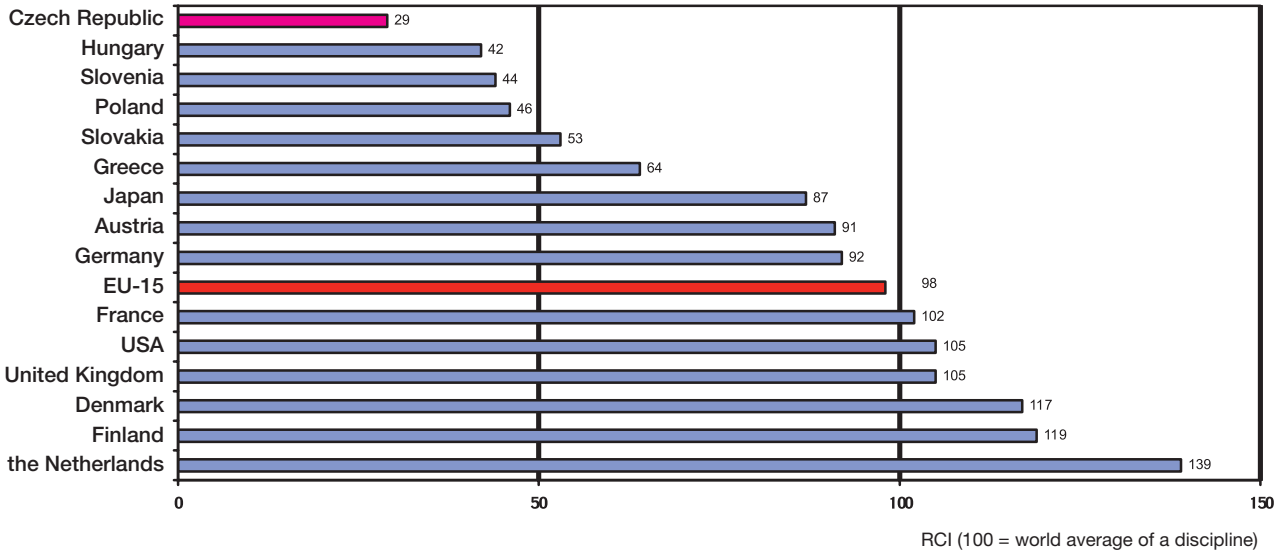
(2) A conclusion can be deduced that the ever increasing bibliometric quality of publications reflects the structural changes made particularly in the field of basic research in the course of transformation of the Czech research and development at the beginning of the 1990's. The emphasis is evidently laid upon the quality of the research made, the effective publication policy is maintained and the international collaboration rises above all due to the involvement of our research workers in the EU framework programmes.

D.3.3 Comparison of scientific disciplines in the Czech Republic and selected countries pursuant to the relative citation index of a discipline in 1999–2003

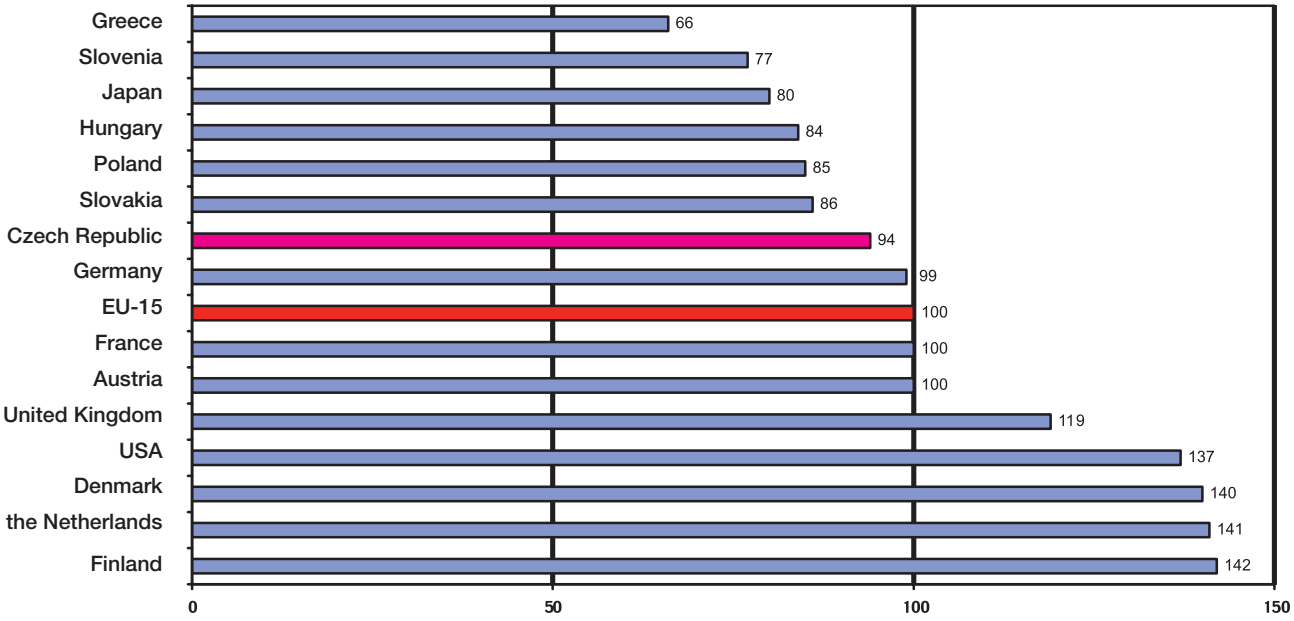
RCIO – Agricultural sciences



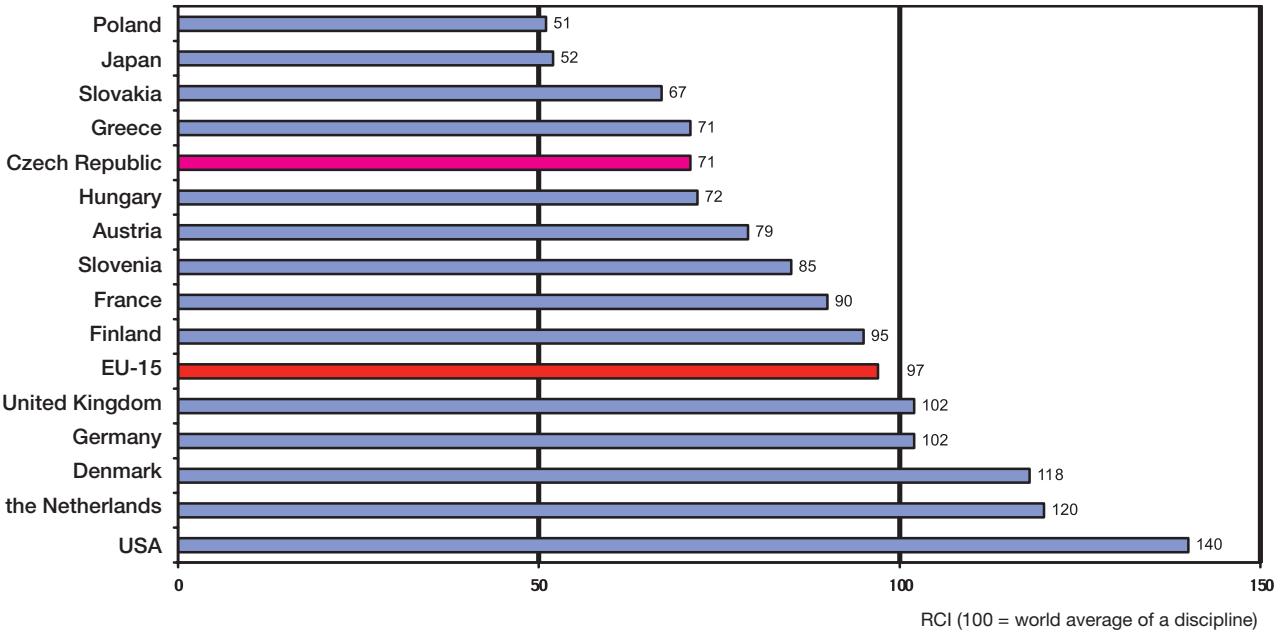
RCIO – Biology and biochemistry



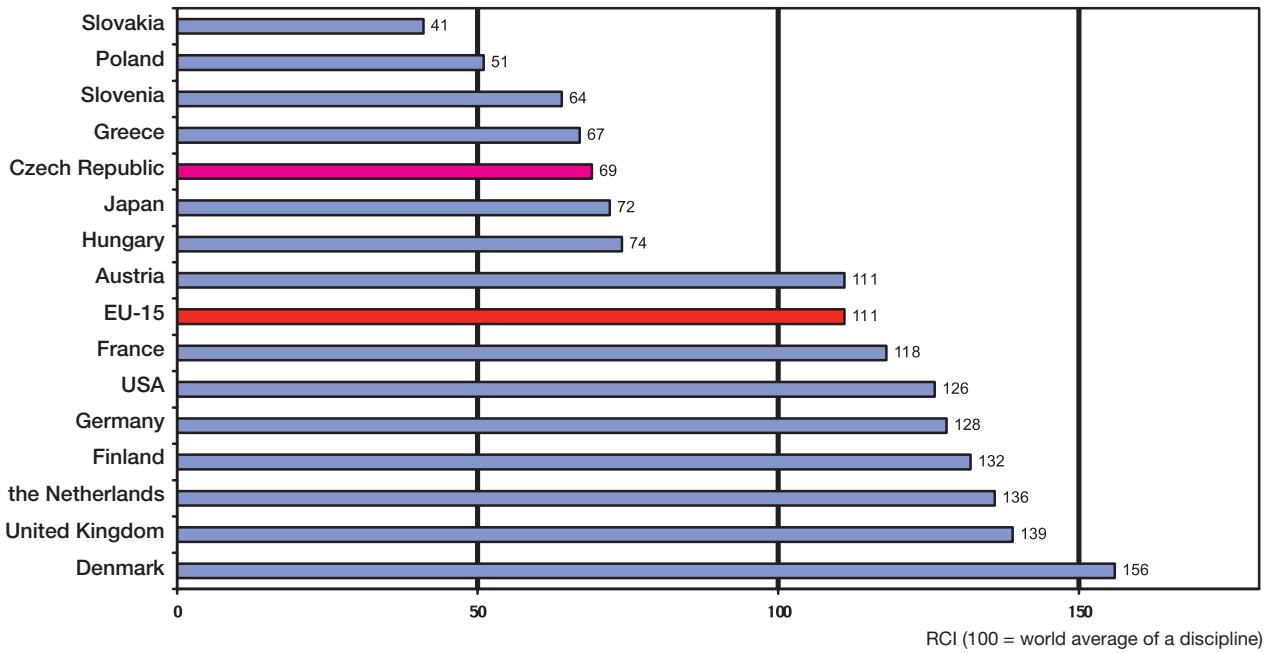
RCIO – Clinical medicine



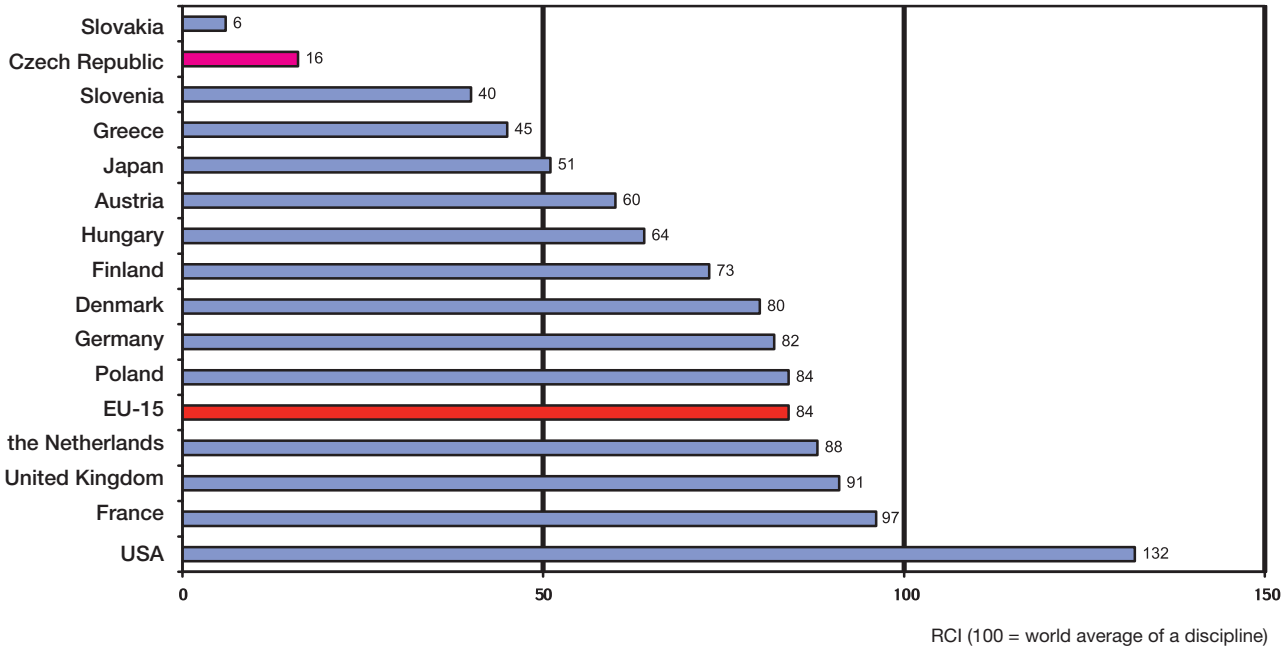
RCIO – Computer sciences



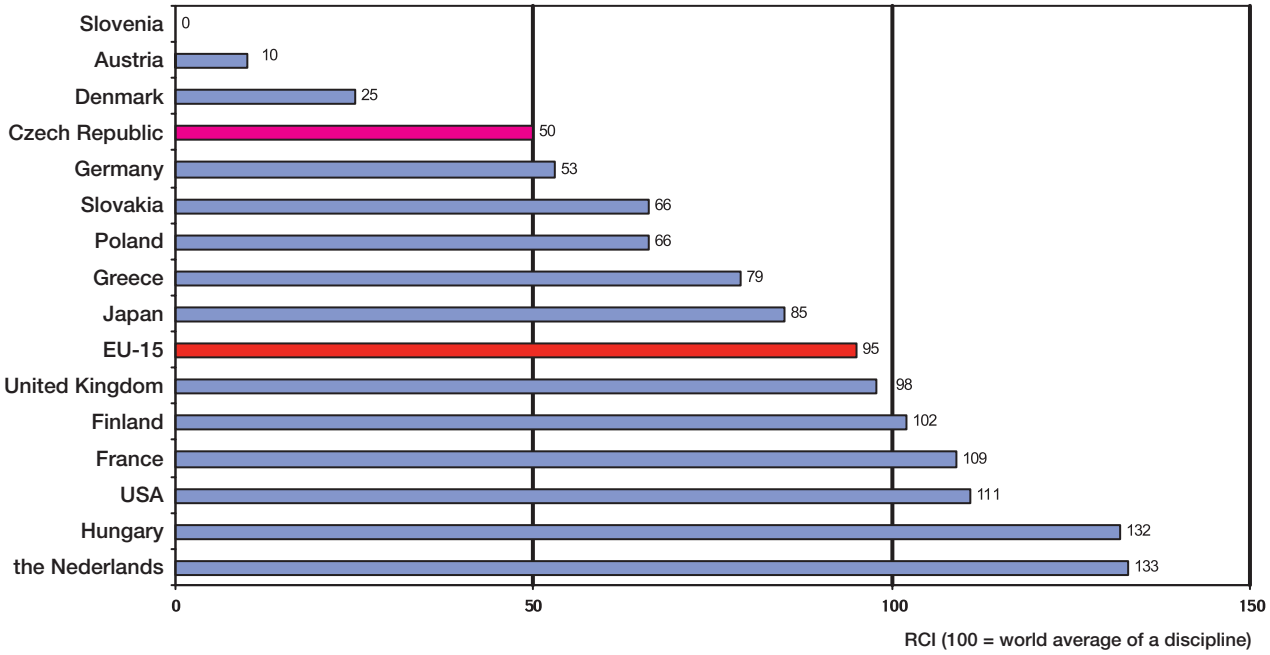
RCIO – Ecology and environment



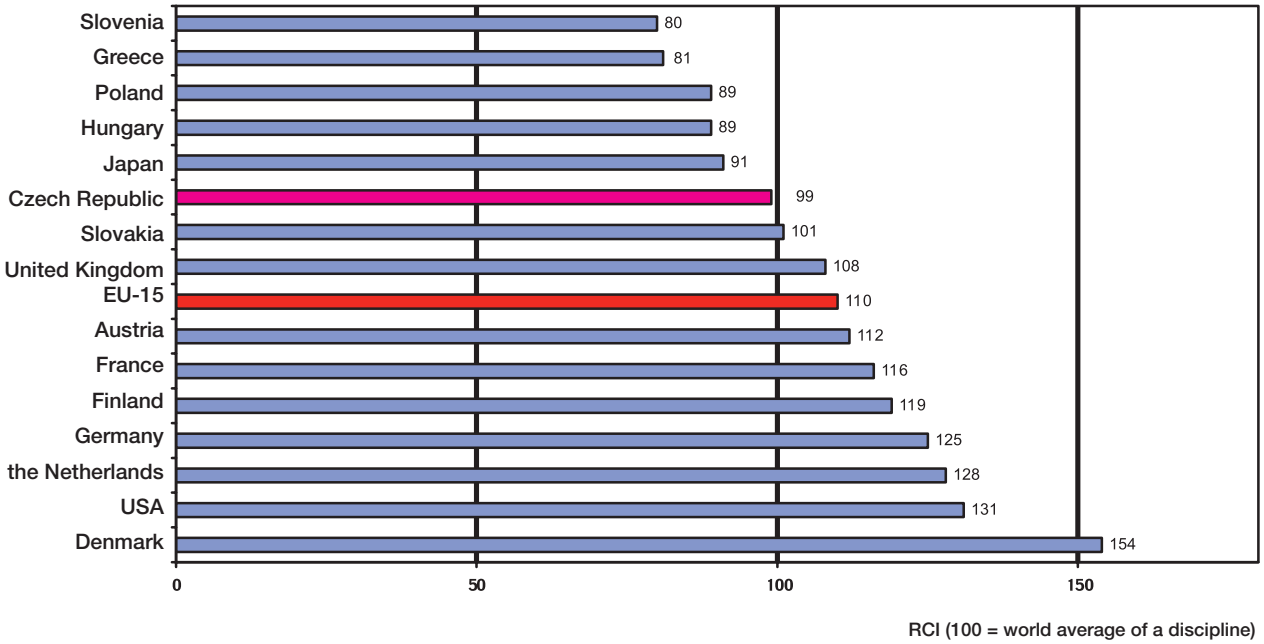
RCIO – Economy and trade



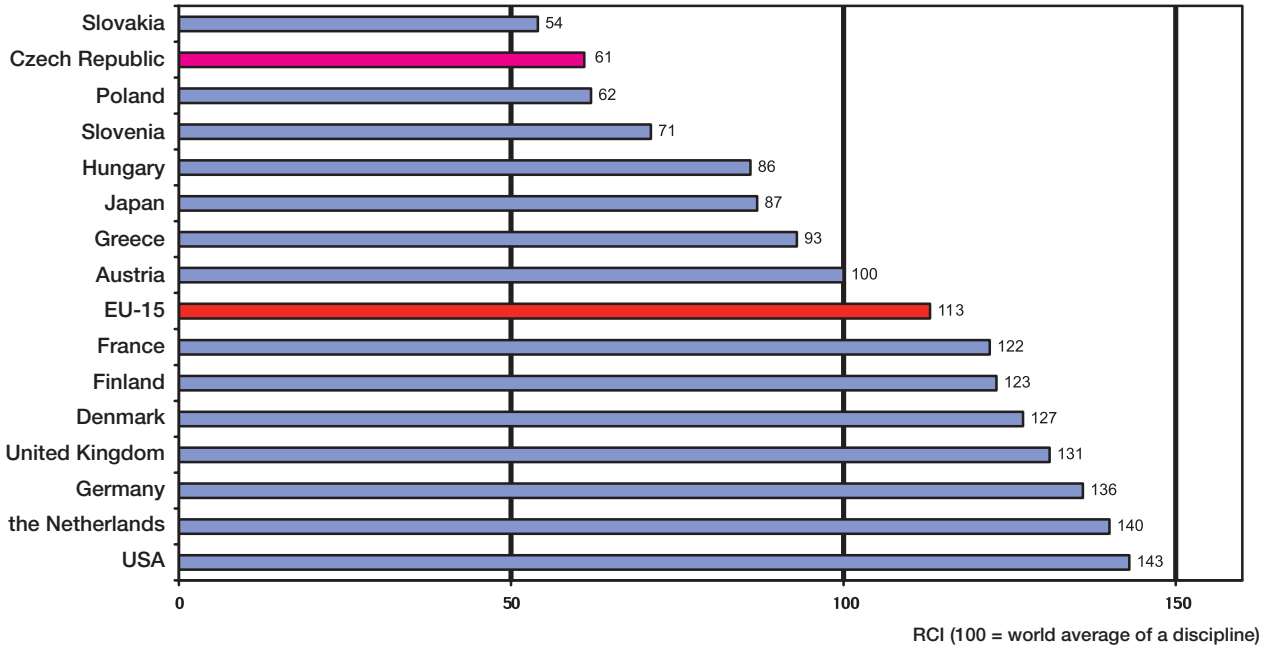
RCIO – Education



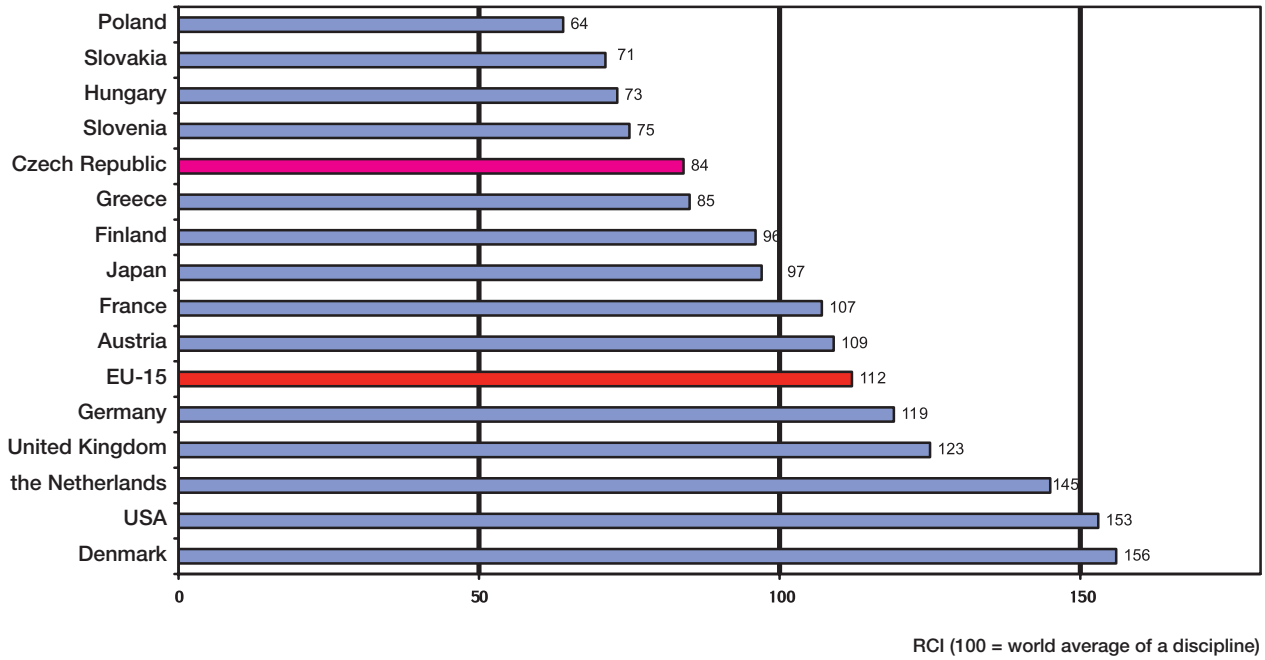
RCIO – Engineering



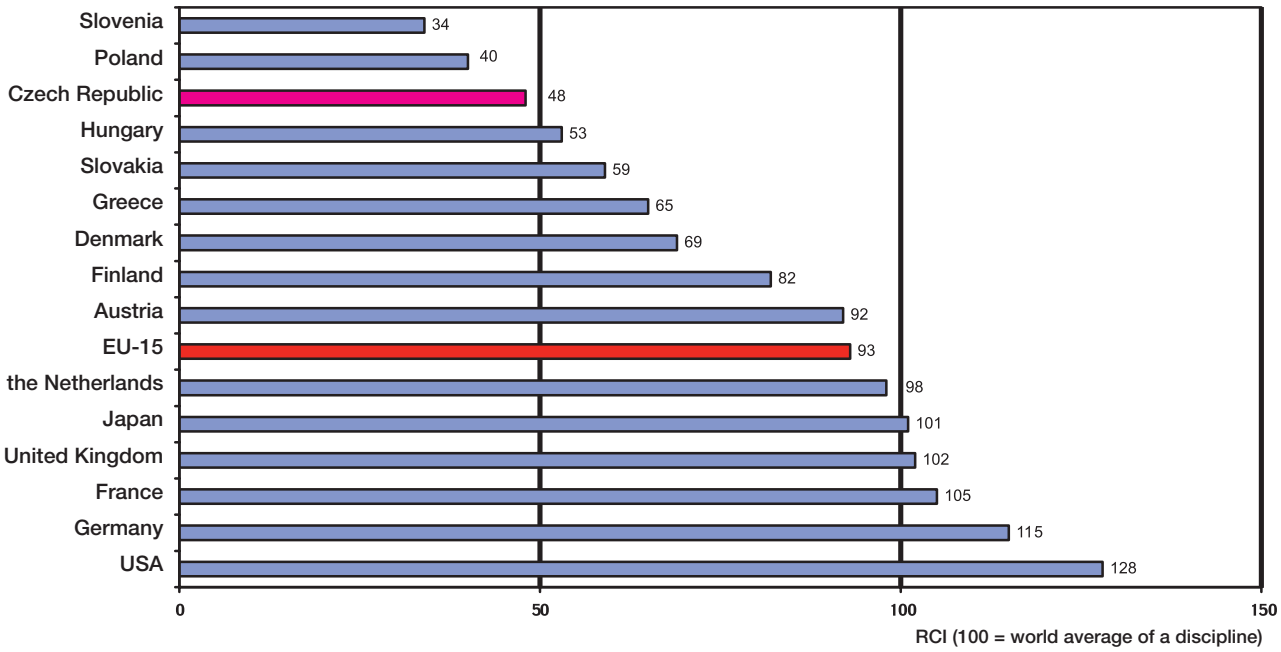
RCIO – Earth sciences



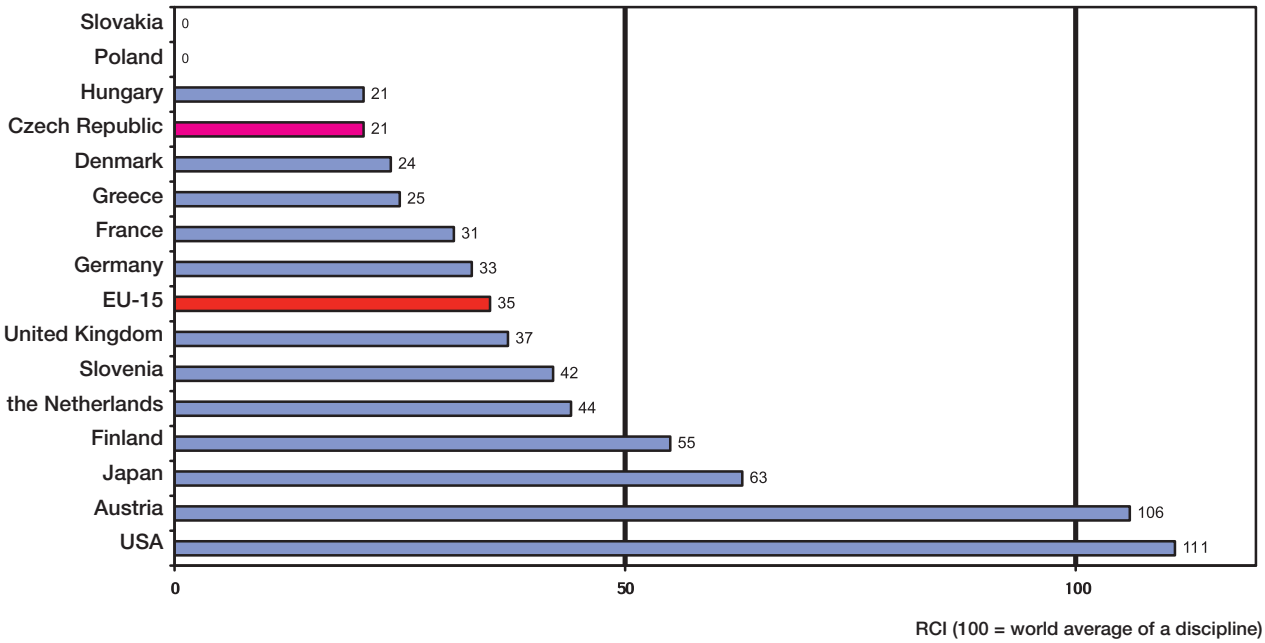
RCIO – Chemistry



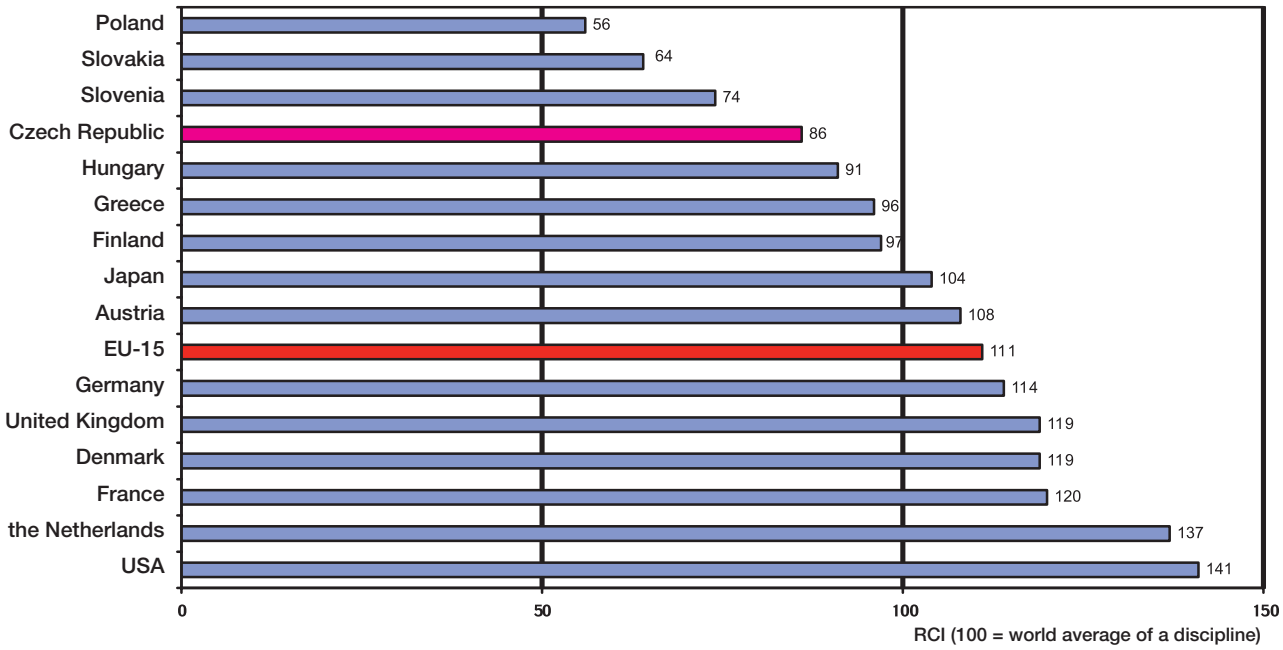
RCIO – Immunology



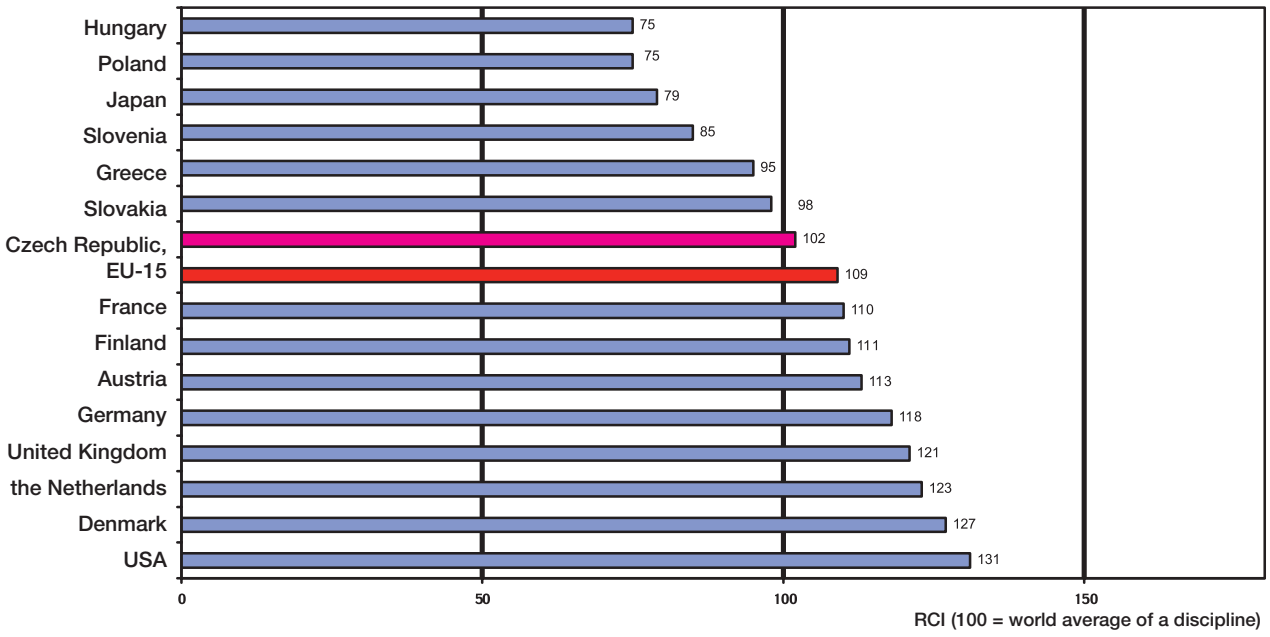
RCIO – Legal sciences



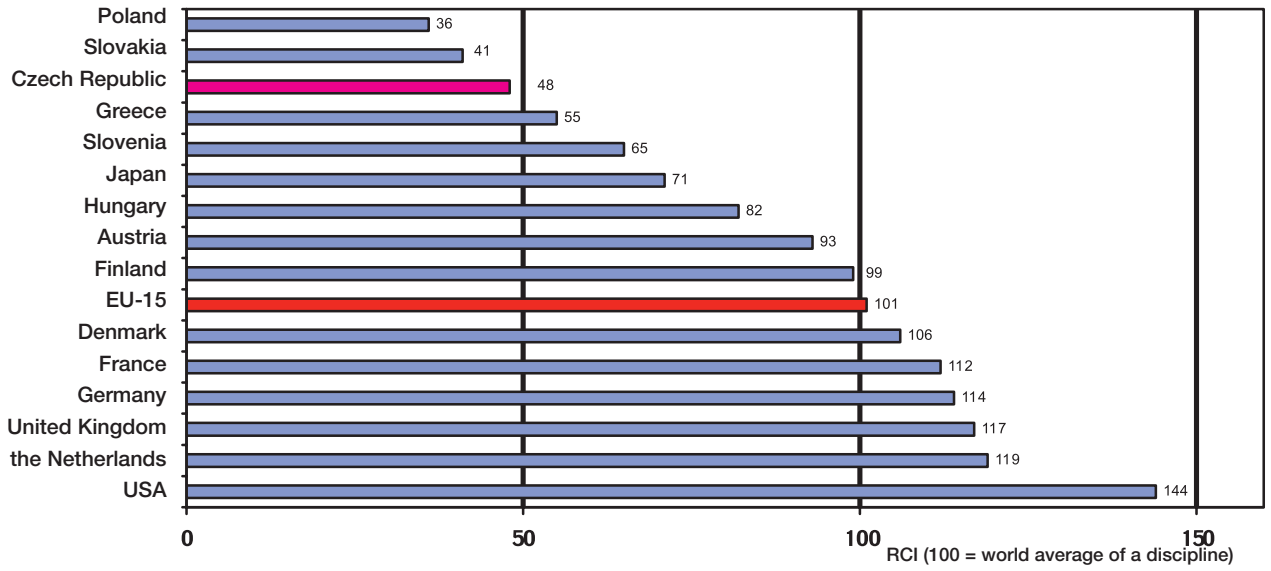
RCIO – Material sciences



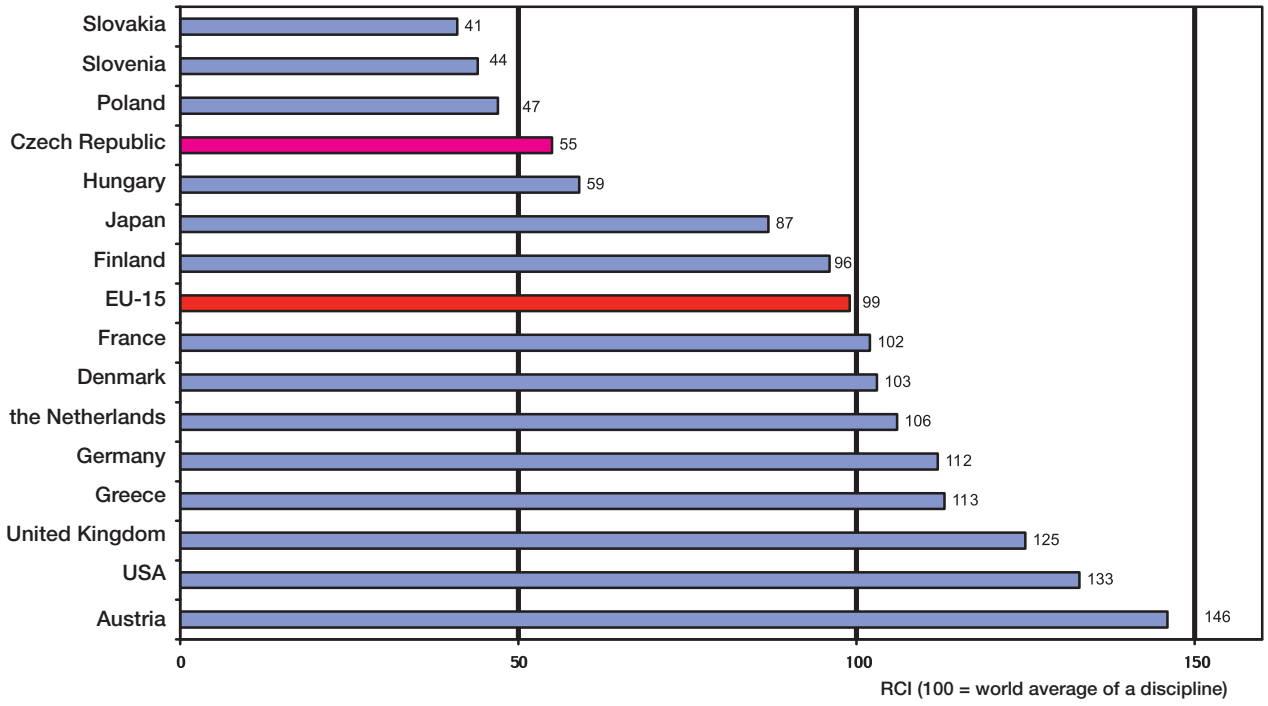
RCIO - Mathematics



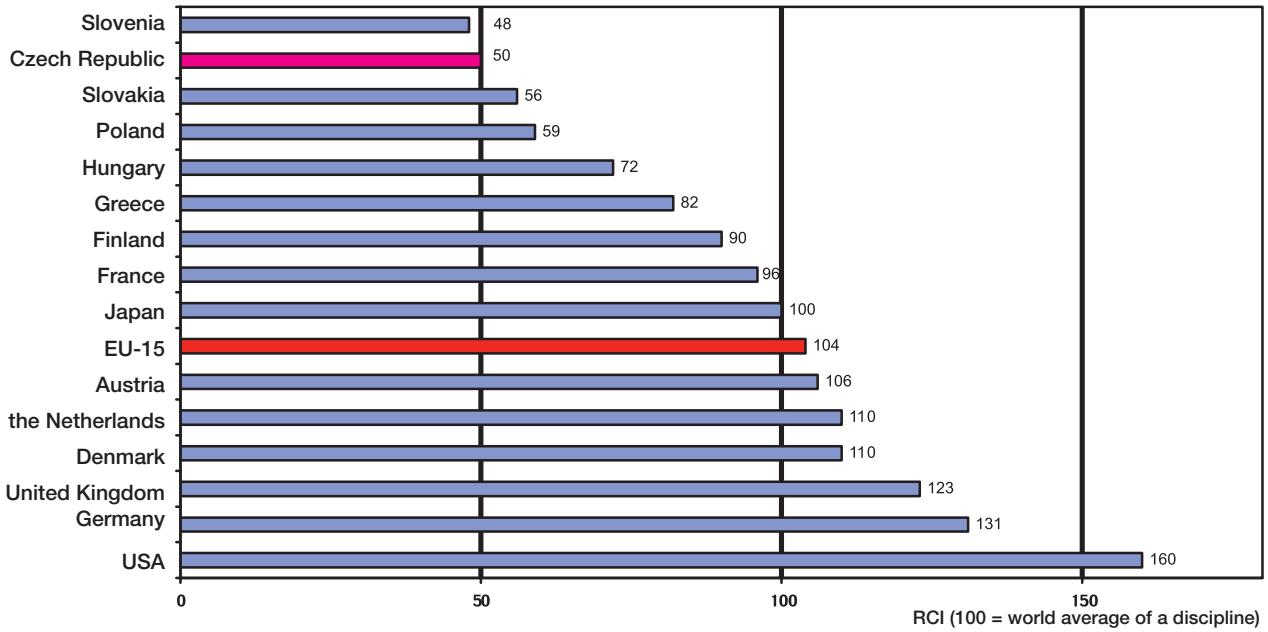
RCIO – Microbiology



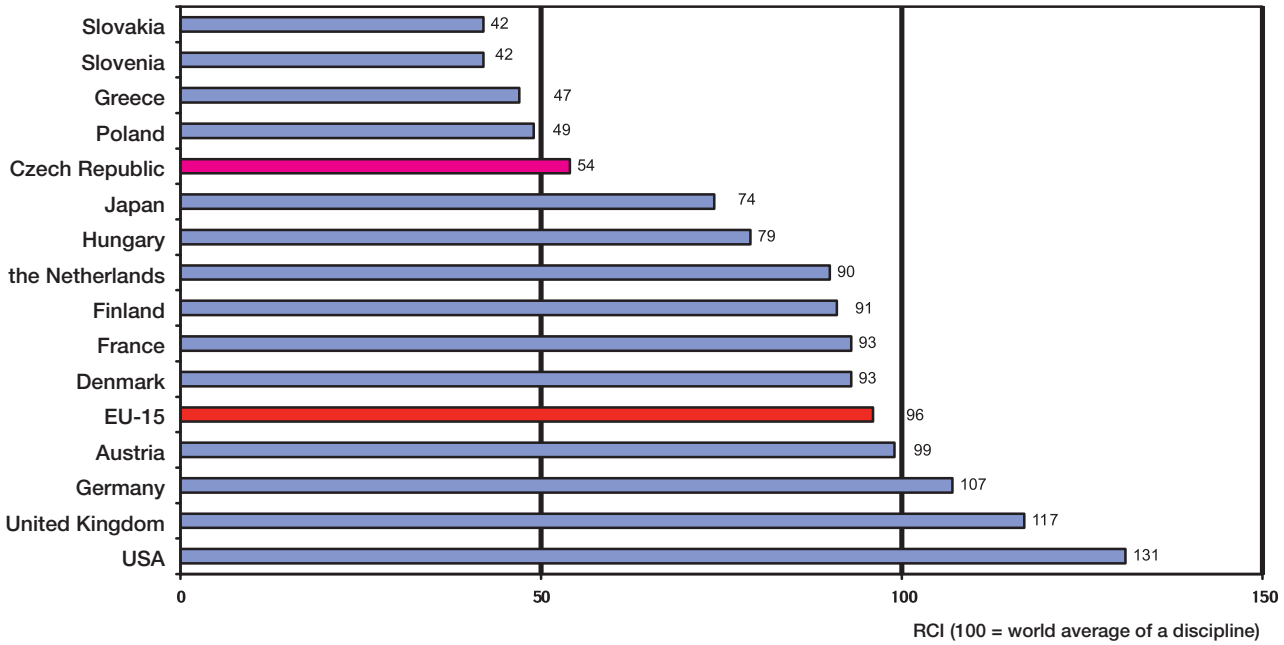
RCIO – Molecular biology and genetics



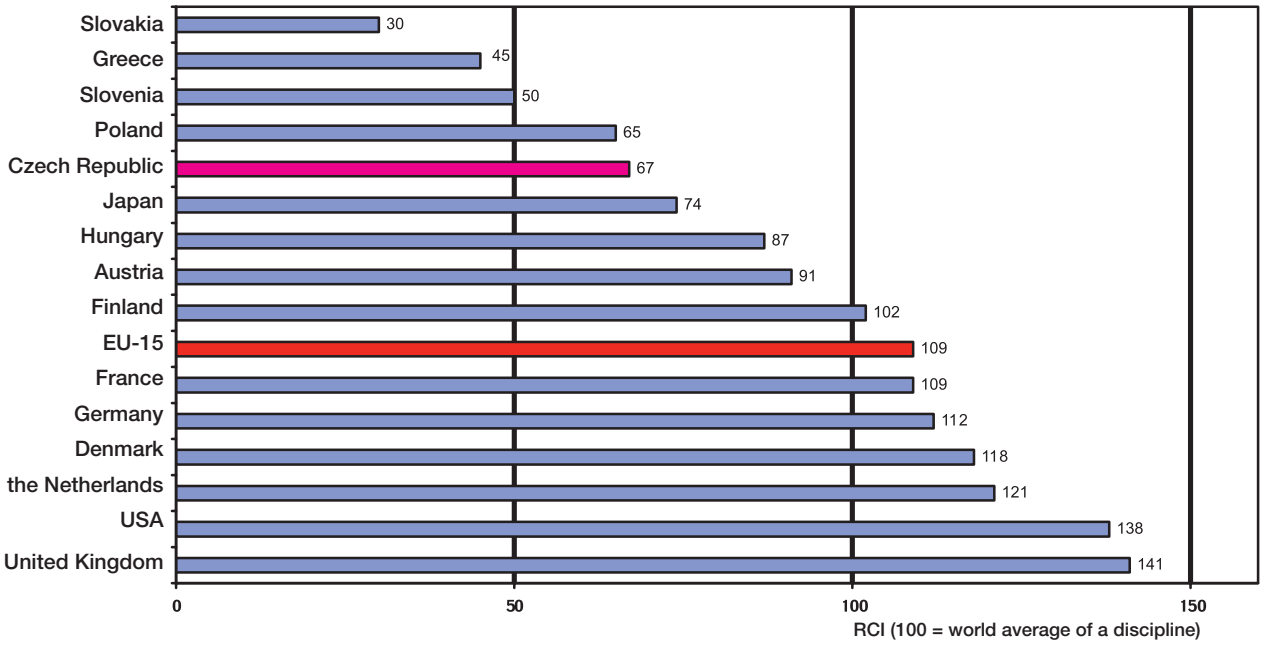
RCIO – Multidisciplines



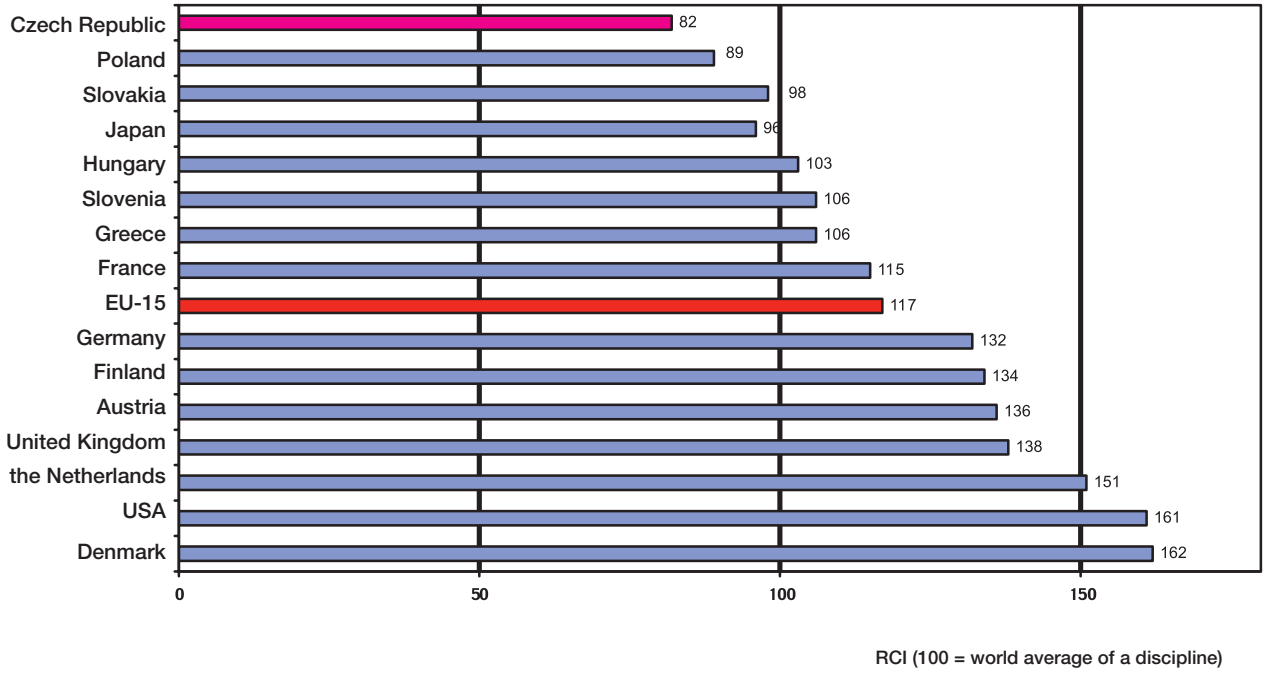
RCIO – Neurosciences and behavioural sciences



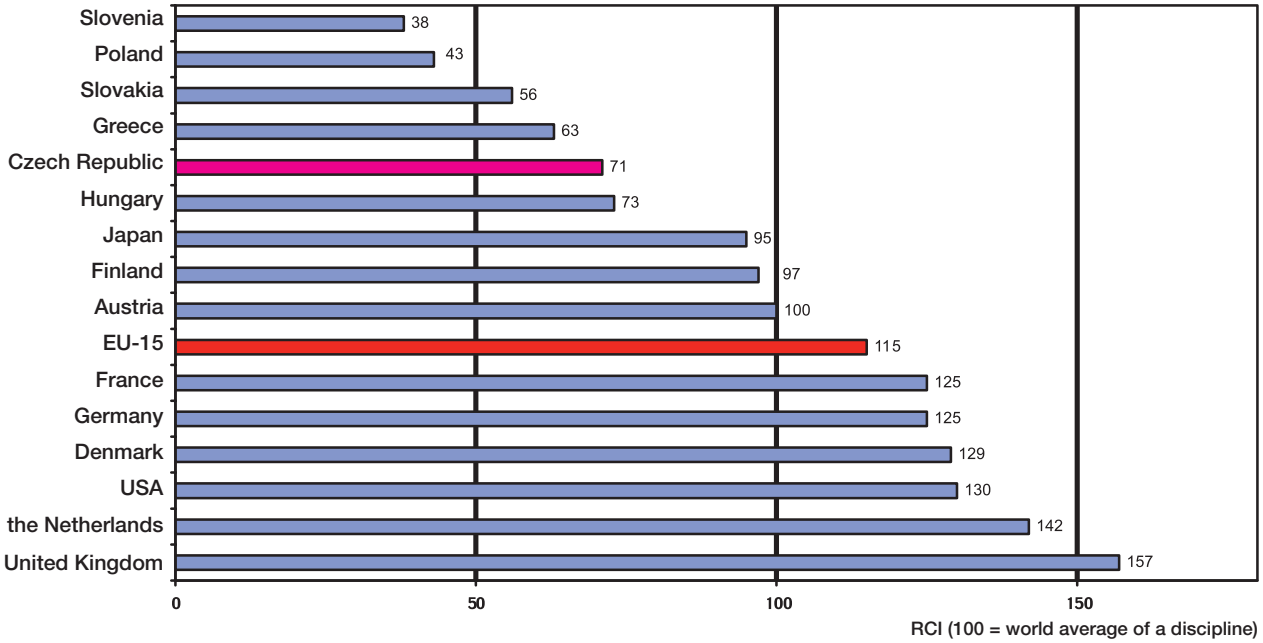
RCIO – Pharmacology



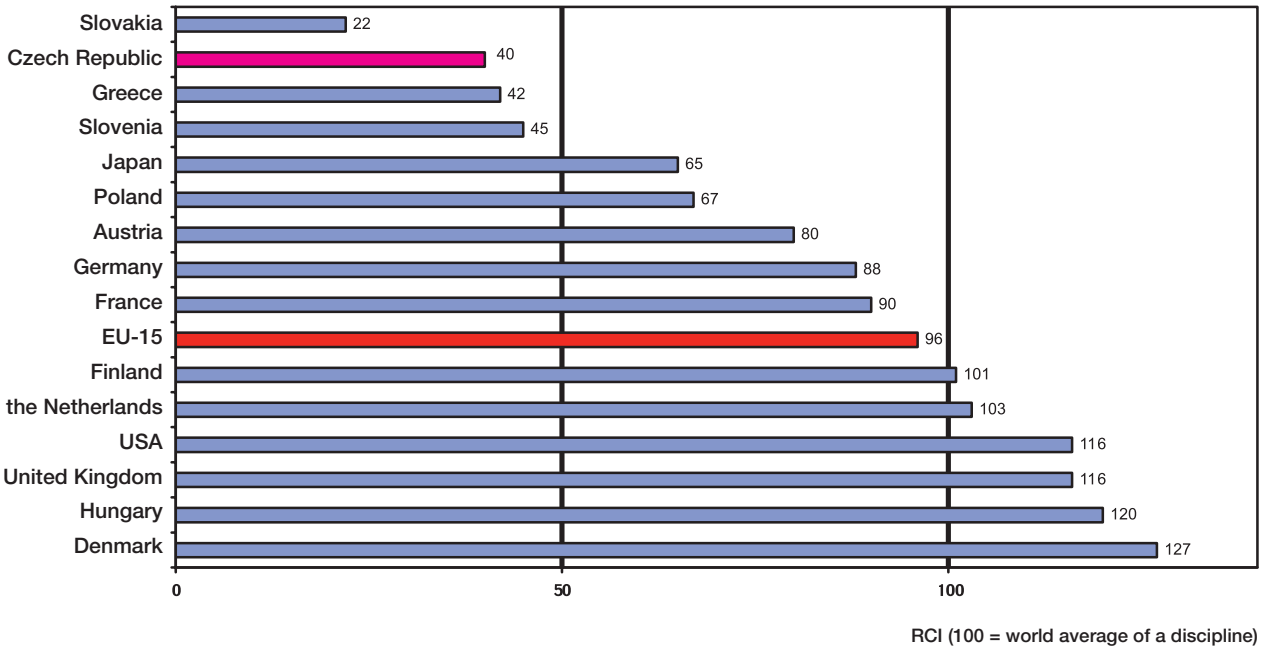
RCIO – Physics



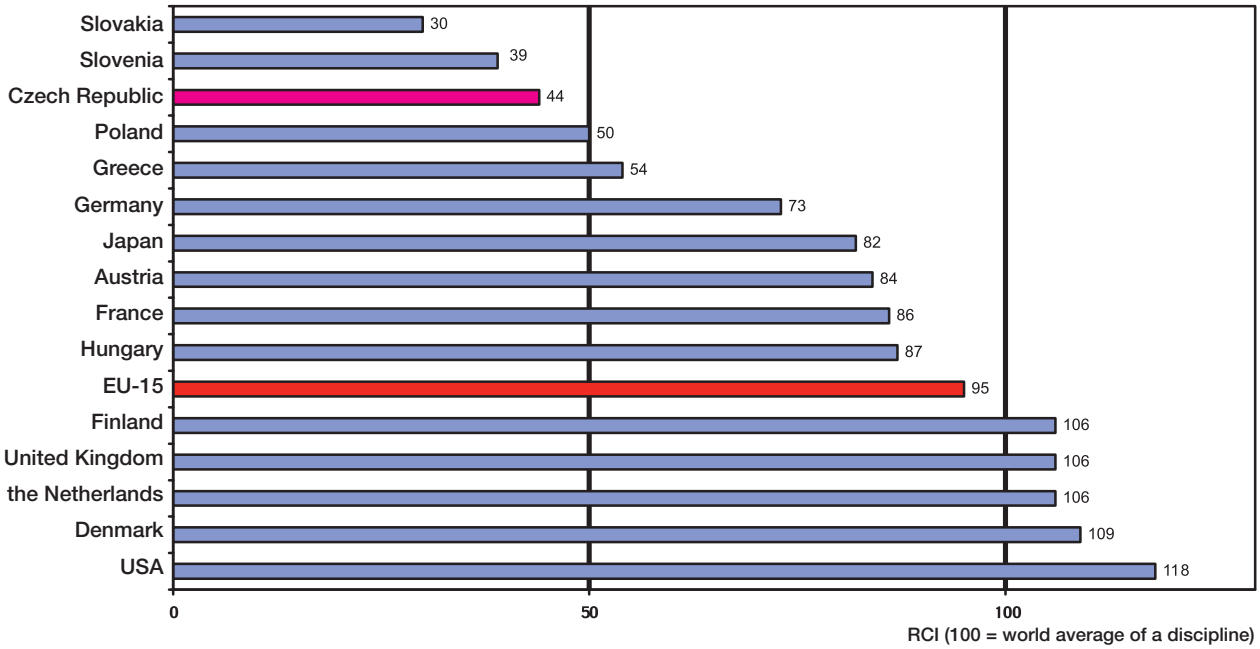
RCIO – Botany and zoology



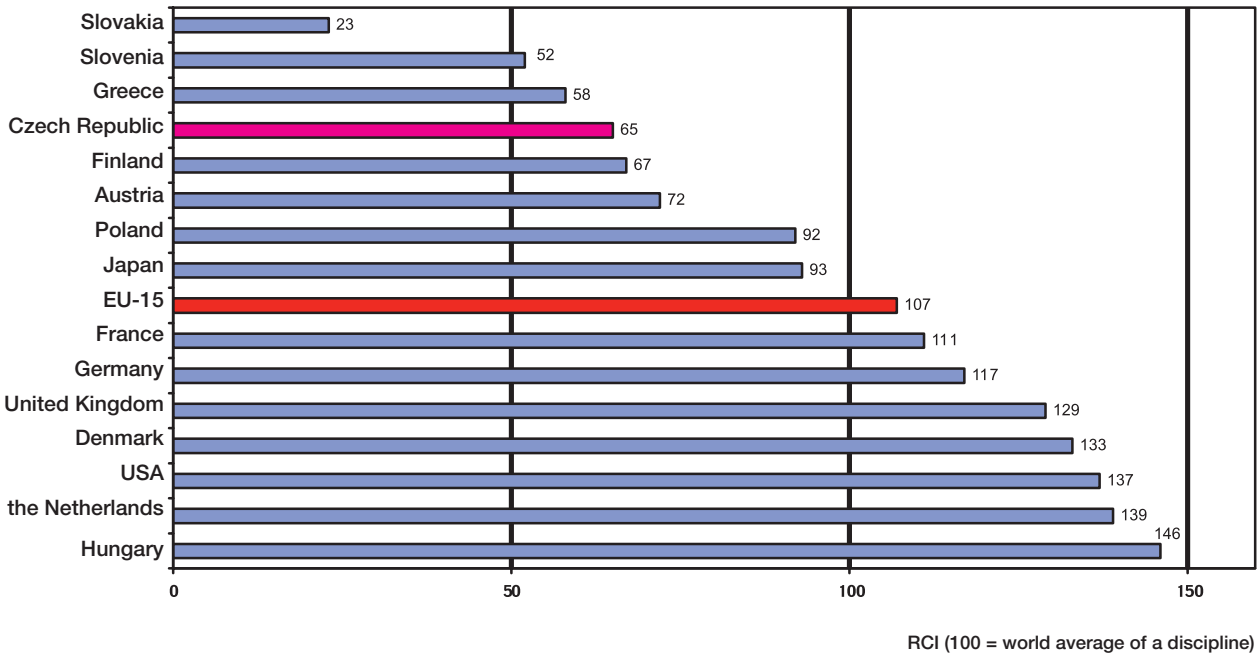
RCIO – Psychology and psychiatry



RCIO – Social sciences



RCIO – Space sciences



Source: Thomson ISI® National Science Indicators (NSI), version 1.5 - Standard, Philadelphia USA, 2003

Definition: RCIO stands as abbreviation for the relative citation impact of a discipline of a country defined as the citation impact of a discipline of the given country (region) divided by the citation impact of the same discipline of the world data base (citation register) of Thomson ISI. It refers to publications and their citations produced by research of a given discipline in the Czech Republic in a given period. The RCIO indicator compares the level of bibliometric quality of publications of a given discipline in a particular country (region) with the level of the world average bibliometric quality of publications of the same discipline in the given time period.

RCIO = 100 means that the discipline in a particular country (region) has the same level of bibliometric quality of publications as is that of the world average bibliometric quality of publications of the same discipline. RCIO > 100 means the level higher than average, while RCIO < 100 means the level lower than average.

Note: Detailed definition of indicators and the evaluation methodology are available at www.thomson.com/scientific/stientific/jsp

Note: Within the NSI product the classification of disciplines is based on the categorisation used with certain ISI modifications in Current Contents periodical. Individual publications are broken down by disciplines upon the reference of periodicals, in which they are published. In the applied NSI instrument (standard version) each periodical is classified into one of 24 disciplines. Therefore the definition of disciplines is bibliometric by purpose and it is not based strictly upon the definition of a discipline used in the scientific methodology.

Commentary:

(1) Among 24 disciplines in the Czech Republic monitored by the value of the RCIO indicator the leading position is taken by three disciplines with RCIO value around 100. These are mathematics (102), engineering (99) and clinical medicine (94). Another three disciplines show the RCIO value higher than three quarters of the world average – material sciences (86), chemistry (84) and physics (82). But the distance from the most advanced countries is noticeable; these three disciplines (considered in the Czech Republic as being on a very good level) exceed only slightly one half of the value of the leading countries.

(2) Following 9 disciplines of the Czech Republic show the level of bibliometric quality of publications of a particular discipline only a little bit higher (50–71) than is one half of the world standard (and ca one third of the most advanced countries value). But for the disciplines like pharmacy, space sciences and computer science it is necessary to take into account the low number of included publications as well (annually les than 100 – see D 3.4).

(3) The level of this indicator for another 7 disciplines lies deeply below the average – lower than one half of the world standard (and ca one third of the most advanced countries value). Among them are immunology (48), microbiology (48), agricultural sciences (45), social sciences (44), biology and biochemistry (42), psychology (40), and economy (16) taking the last place.

(4) For disciplines like education (50) and legal sciences (21) it is very difficult to make any comparisons at all considering the extremely low number of included publications (annually less than 5 – see D.3.4).

D.3.4 Development of the relative citation index of disciplines and number of publications in the Czech Republic in 1994–2003

Commentary:

(1) Essential for characteristics of the bibliometric quality of publications in any discipline is not only the comparison of the relative citation impact of this discipline in the Czech Republic with values of this indicator in the selected countries (see graphs D.3.3), but also the development of this indicator in the course of past ten years. The left column shows the RCIO values for 24 disciplines, while the right column reports the numbers of publications in a particular discipline (the less the numbers of publications, the less the evidentiary capacity of RCIO values – one or a few of frequently cited publications then increases the image of high quality of this discipline as a whole). The low number of publications is the very cause of considerable changes of RCIO for education and legal sciences.

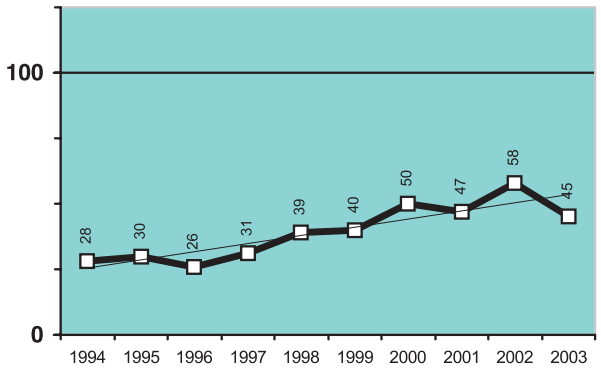
(2) Most of the disciplines with a significantly positive trend of RCIO value are at the same time the disciplines with its high absolute value – mathematics, clinical medicine, engineering and material sciences. Other disciplines with high absolute value of RCIO experience a slower pace of growth (chemistry, physics), yet with a considerable number of publications. In summary, it can be said that according to the above criteria these disciplines belong among the best in the Czech Republic.

(3) A considerable high rate of growth, but from low starting values, report ecology, botany and zoology and neurosciences. Somewhat lower, yet still good pace of growth have the Earth sciences, Space sciences and (with high fluctuations between the years) psychology and psychiatry. Step by step, these disciplines are decreasing the quantitative distance from the advanced countries.

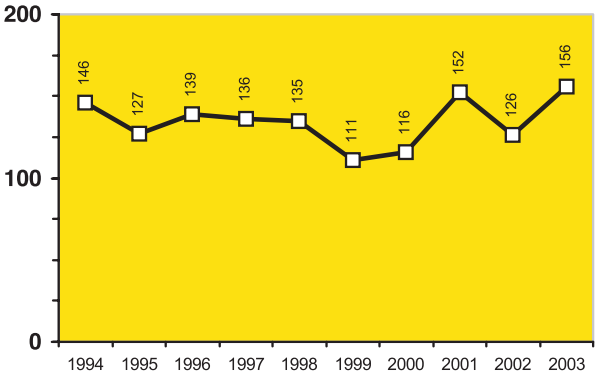
(4) Computer sciences are difficult to evaluate. In 1998 the RCIO indicator was enormously high, over the last years it has been falling. It will be necessary to evaluate the development in longer term.

(5) For the remaining disciplines the bibliometric quality of publications grows only slightly, moreover from low starting values, or even decreases and the gap widens. This does not mean that there are no top teams in these disciplines in the Czech Republic publishing works at world level, but most of the publications from these disciplines have only a minor reception in the world.

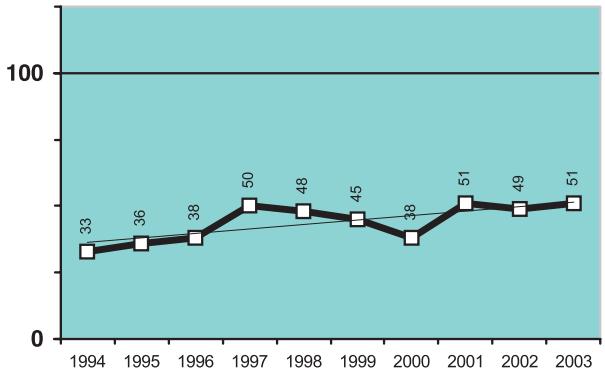
Agricultural sciences - RCIO



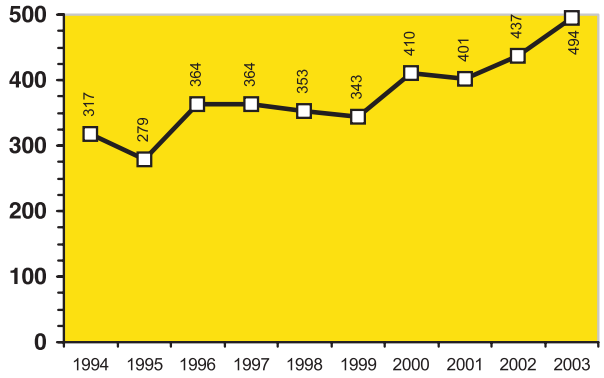
numbers of publications



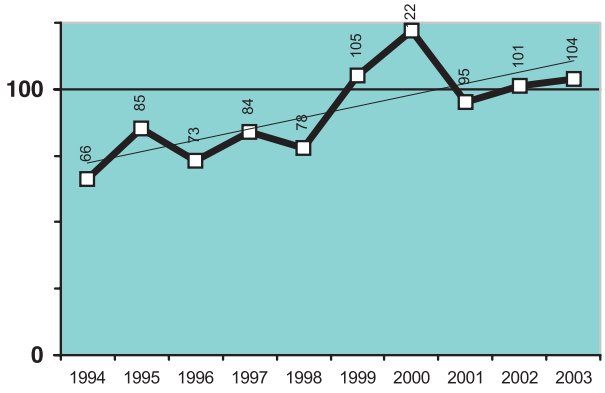
Biology and biochemistry - RCIO



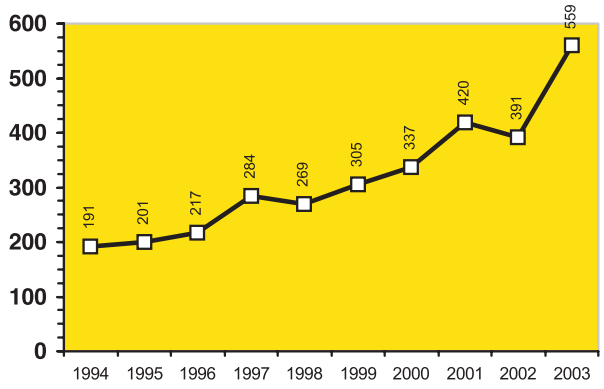
numbers of publications



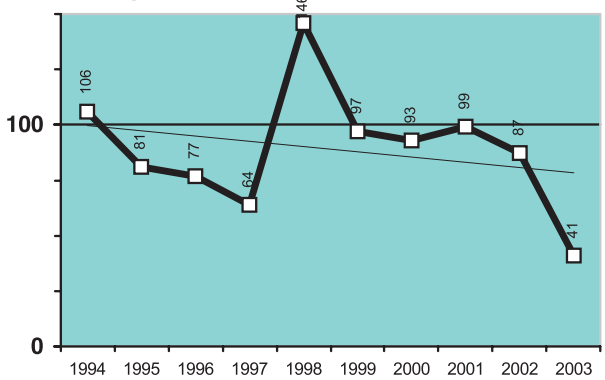
Clinical medicine - RCIO



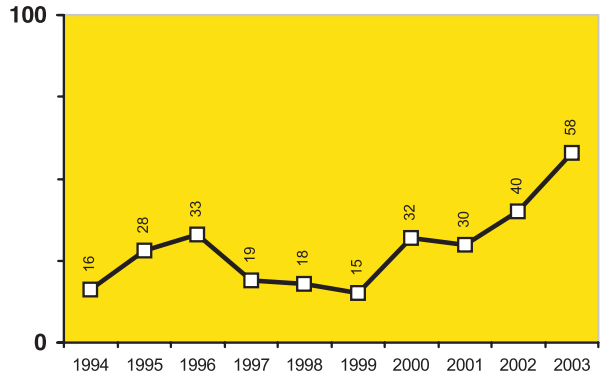
numbers of publications



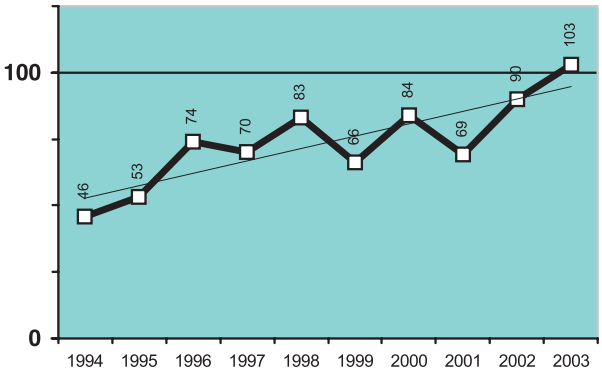
Computer sciences – RCIO



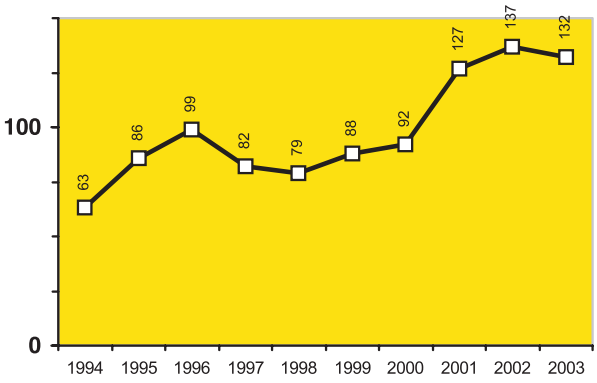
numbers of publications



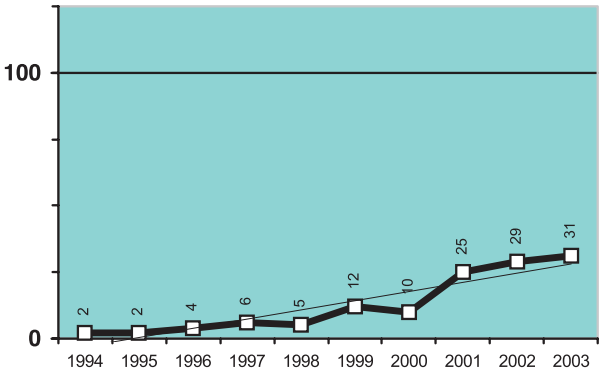
Ecology and environment – RCIO



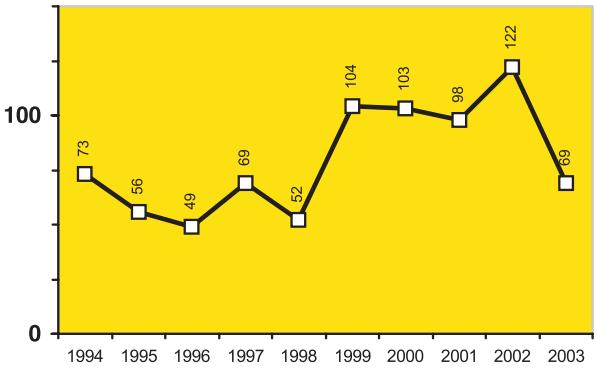
numbers of publications



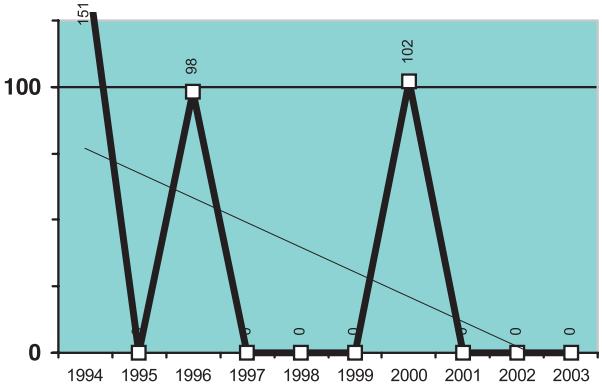
Economy and trade – RCIO



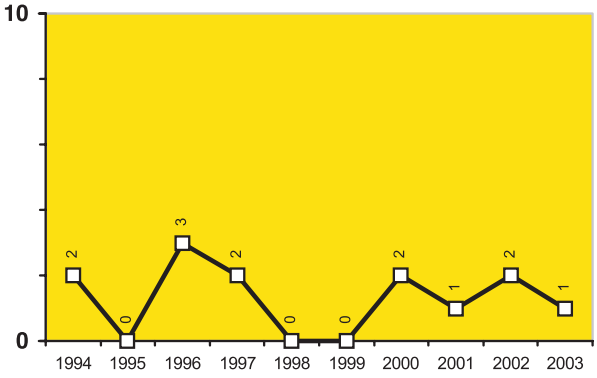
numbers of publications



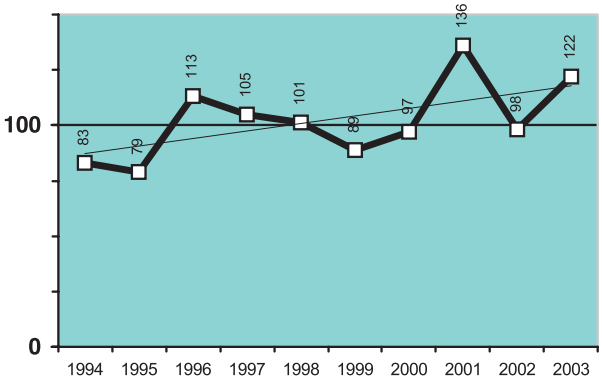
Education – RCIO



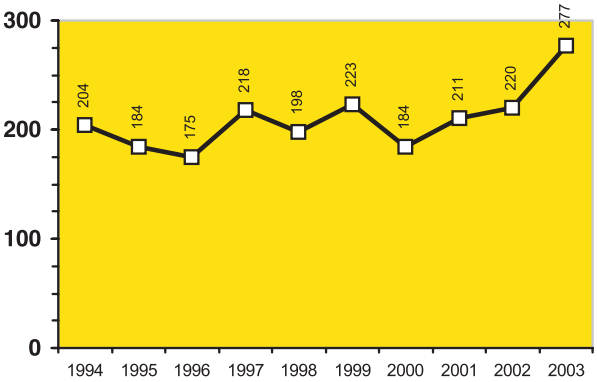
numbers of publications



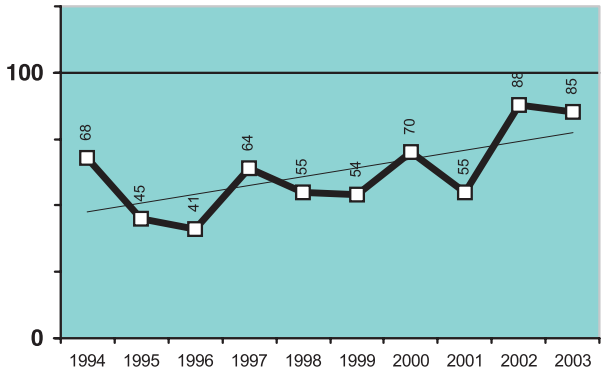
Technical sciences – RCIO



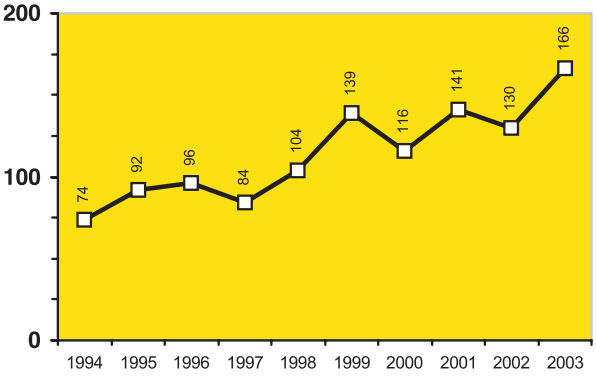
numbers of publications



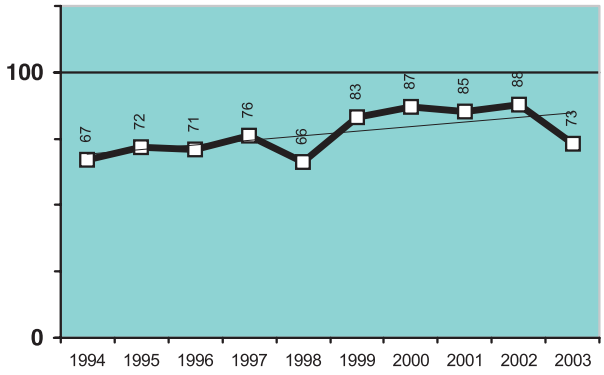
Earth sciences – RCIO



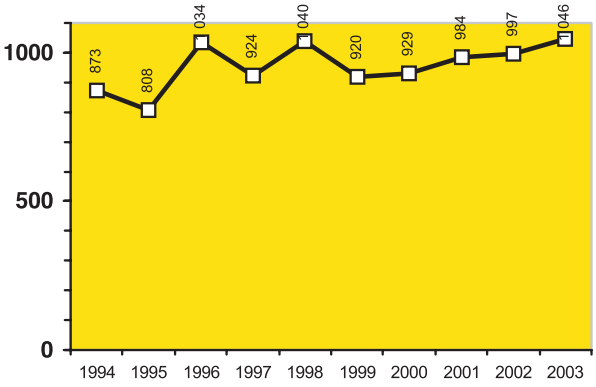
numbers of publications



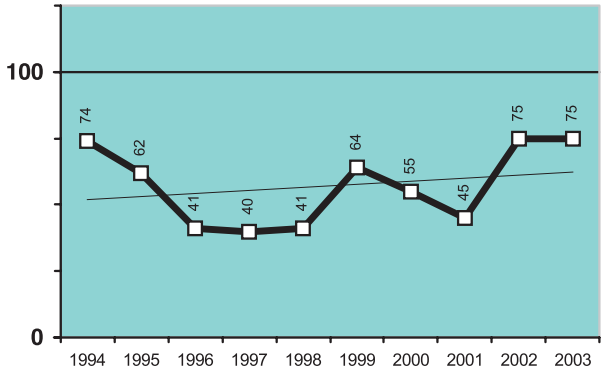
Chemistry – RCIO



numbers of publications



Immunology – RCIO



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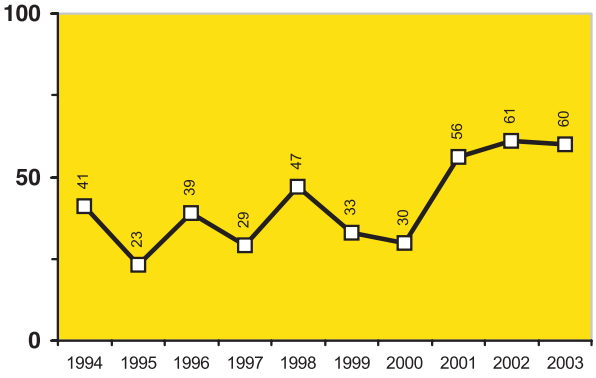
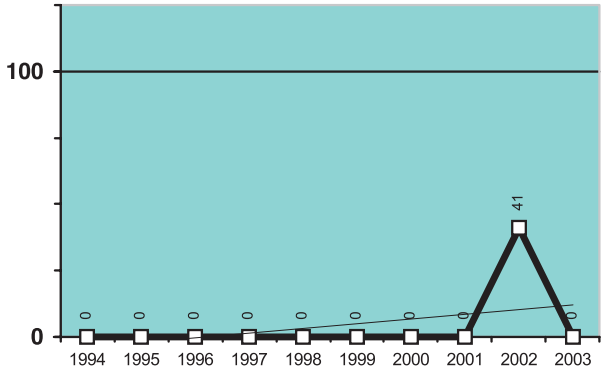
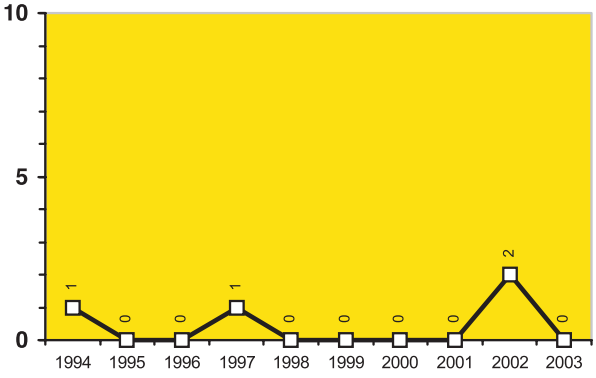


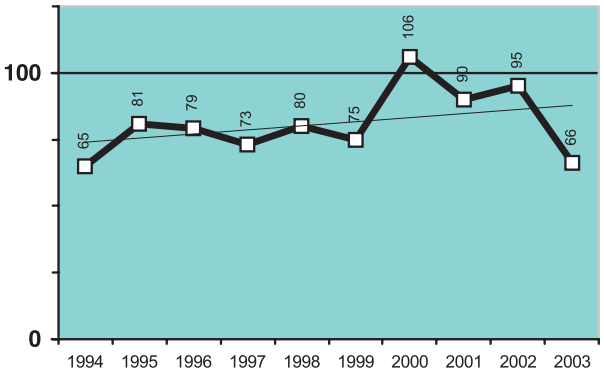
Legal sciences – RCIO



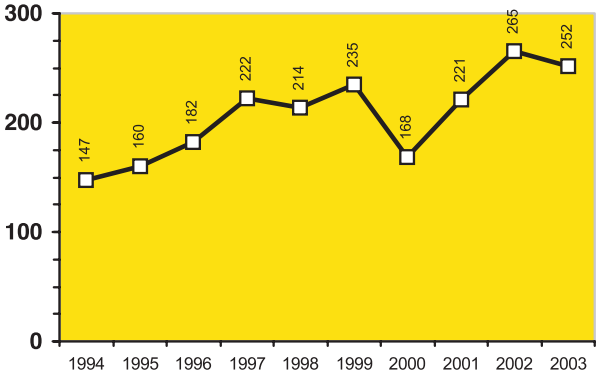
numbers of publications



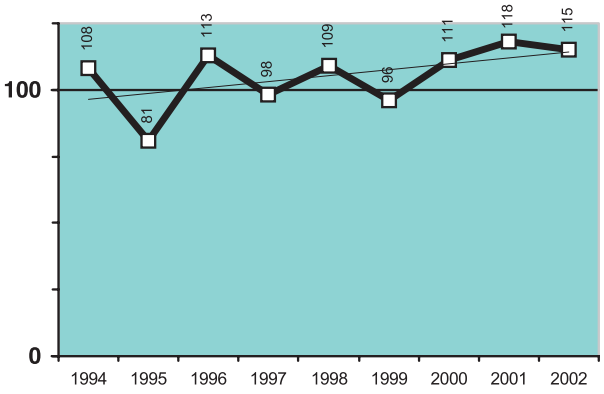
Material sciences – RCIO



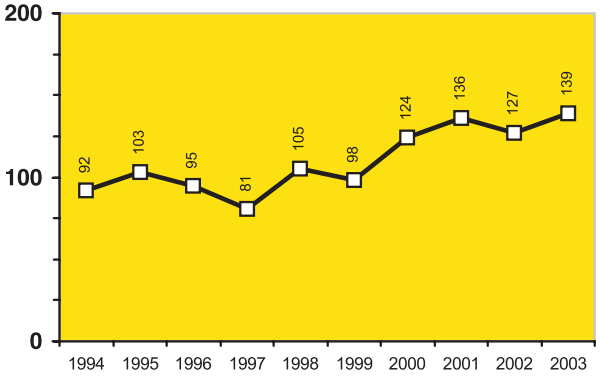
numbers of publications



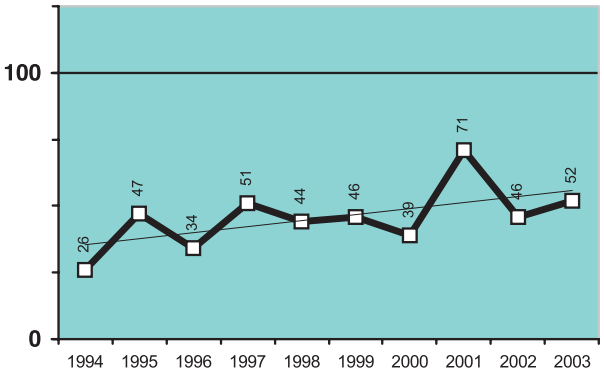
Mathematics – RCIO



numbers of publications



Microbiology – RCIO



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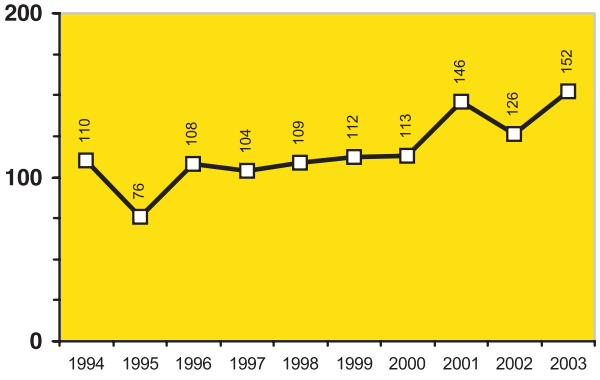
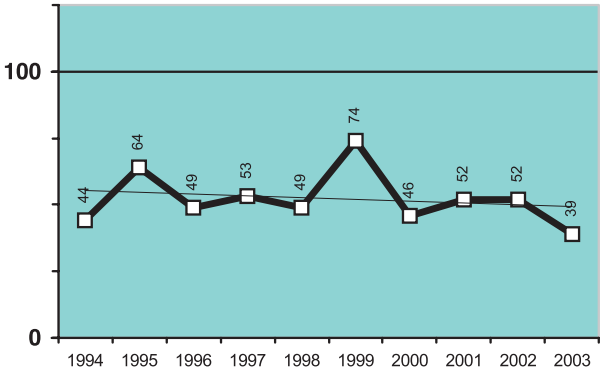


Molecular biology and genetics – RCIO



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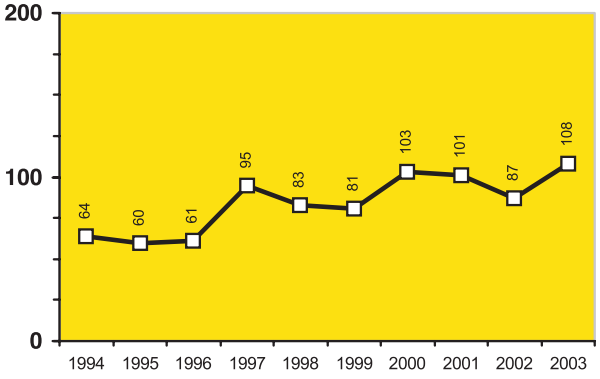
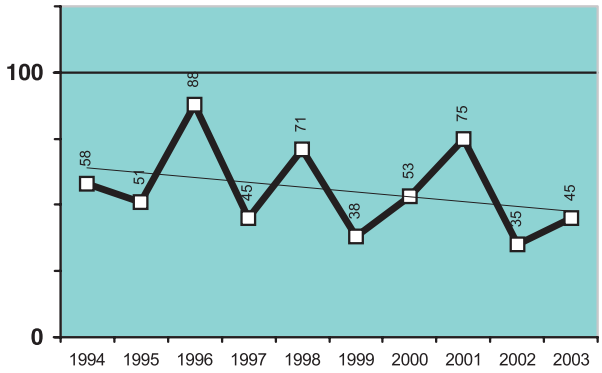


Multidisciplines – RCIO



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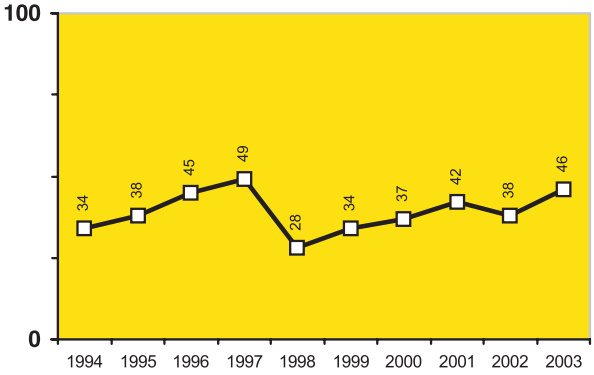
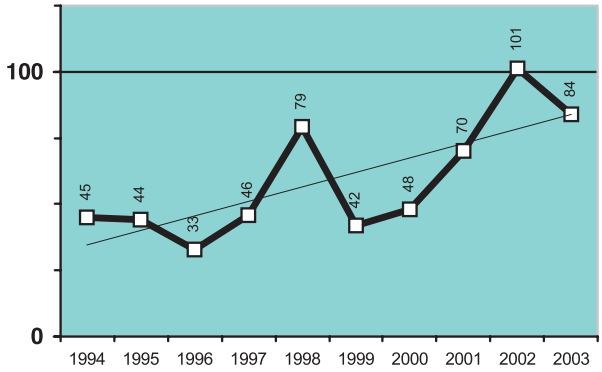


Neurosciences and behavioural sciences – RCIO



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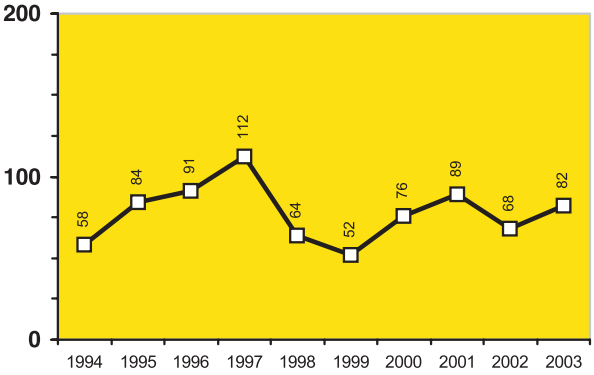
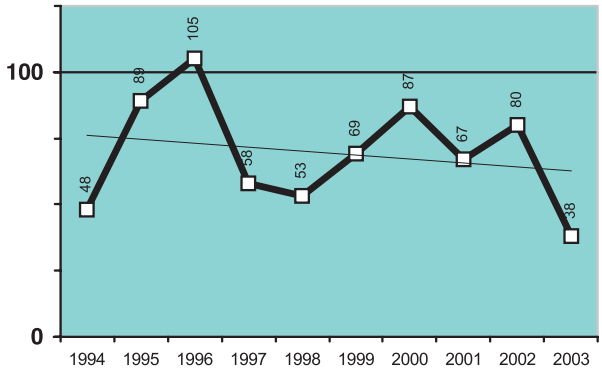


Pharmacology – RCIO



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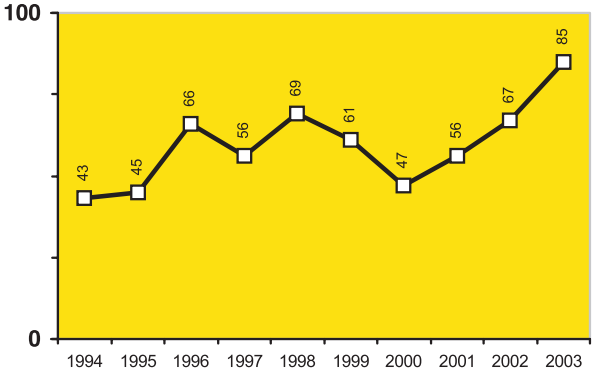
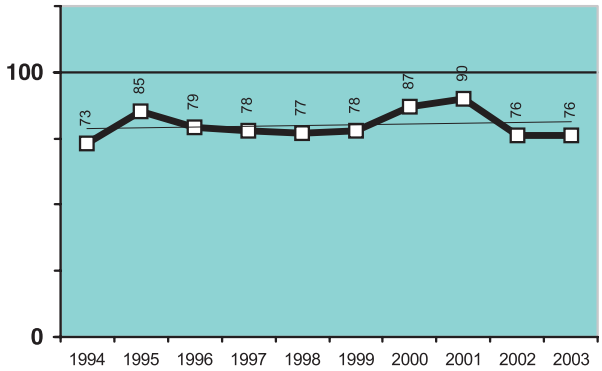
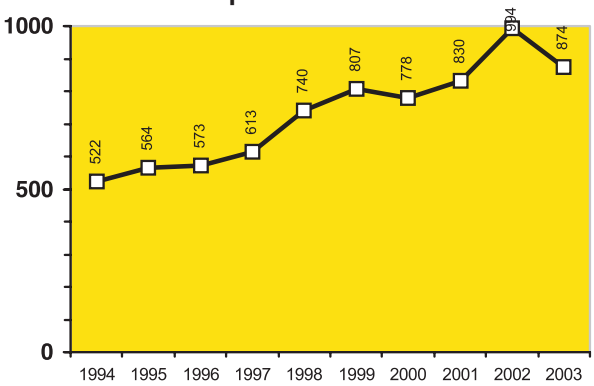


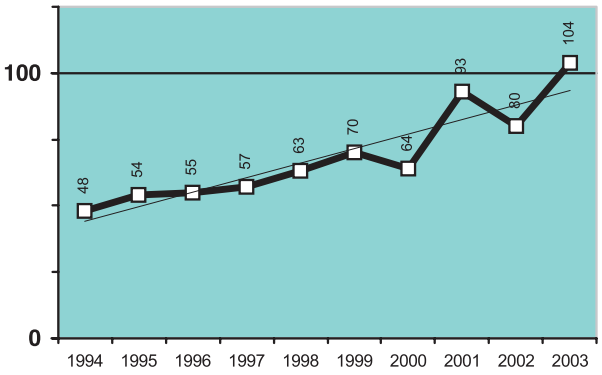
Physics – RCIO



numbers of publications



Botany and zoology – RCIO



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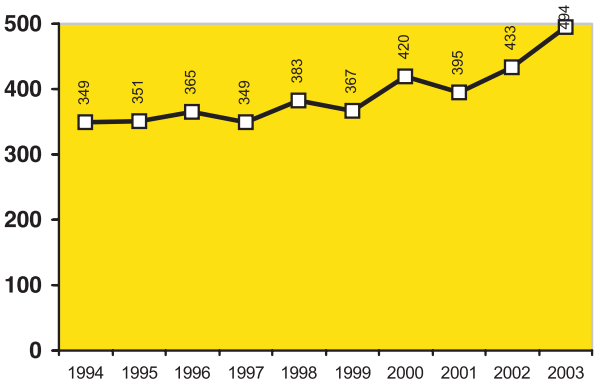
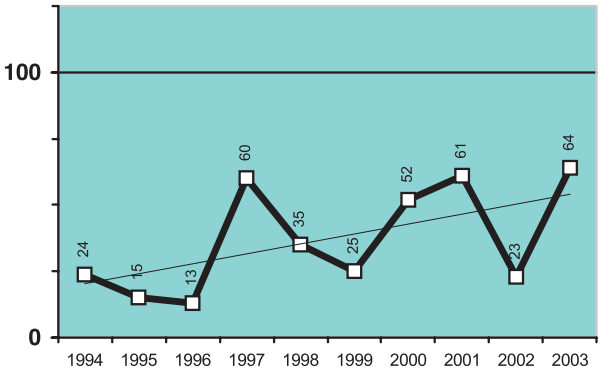


Psychology and psychiatry – RCIO



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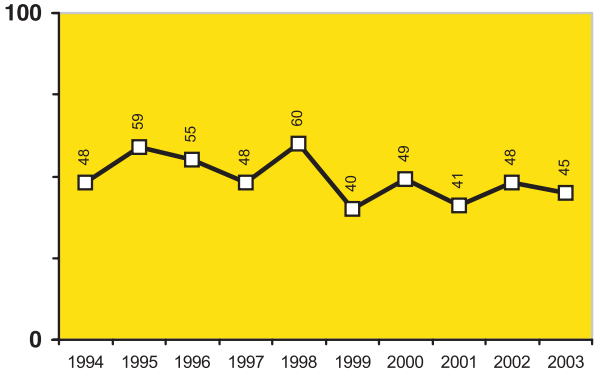
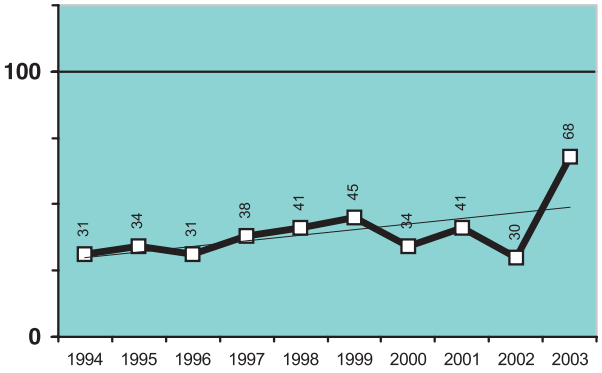
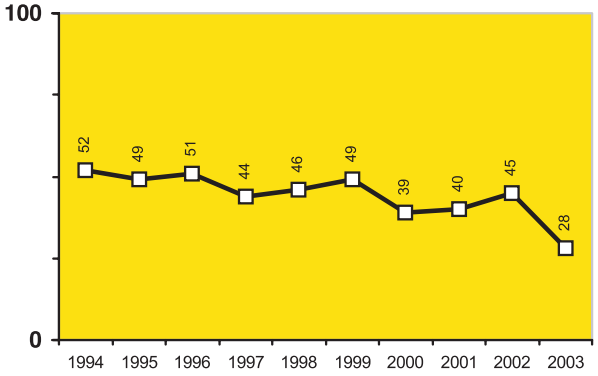


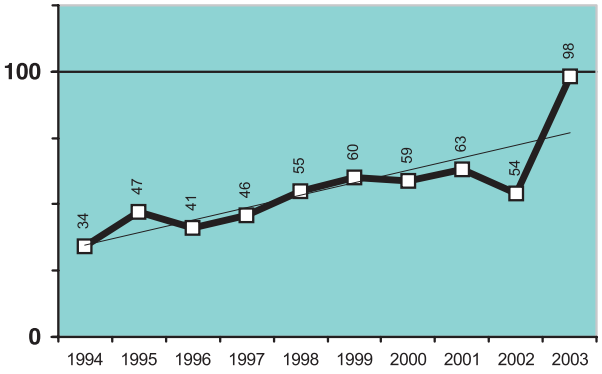
Social sciences – RCIO



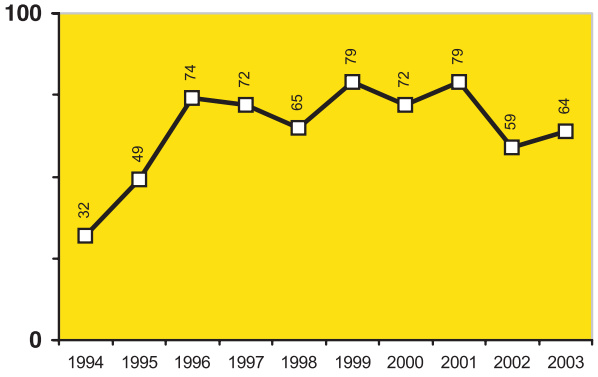
numbers of publications



Space sciences – RCIO



numbers of publications



Source: Thomson ISI® National Science Indicators (NSI), version 1.5 – Standard, Philadelphia USA, 2003

E. Patent applications, granted patents

This chapter follows up with the 2003 analysis. It contains new data on numbers of patents being applied in 2003 with the Industrial Property Office of CR (IPO), European Patent Office (EPO) and U.S. Patent and Trademark Office (USPTO). Newly included are data on patent applications in high technologies filed with EPO between 1996 and 2001 (Table E.8). Data were taken from the annual reports of respective patent offices. Data on the number of patent applications related to high technologies at EPO are taken from the Eurostat material "Spitzentechnologie und Wissenintensität bringen Wertschöpfung" published in August 2004. The IPO terminology is maintained that uses the term "invention application", as well as the EPO and USPTO terminologies that use the name "patent application".

The protection of intellectual property of the research and development results and benefits achieved potentially on the grounds of this protection are considered generally to be an important motivating factor in business. In the concept which takes the number of patent applications and granted patents as an indicator of the research and development efficiency of a given country the number of filed applications or granted patents per million inhabitants of a given country prevails significantly. The numbers of patents converted to the number of research workers are reported only sporadically. If the statement is justified that also other activities than research are the source for many patents, then in high technologies the research usually is the source in a considerably larger number of cases. On the other hand, just in this part of research the public-law protection of results by their patenting is far from being the only way of their protection and further application. The official European Commission documents on benchmarking R&D and innovative policies and documents on further development of the European Research Area objectively point out the advantages and drawbacks of this indicator. The documents also discuss in a great detail the problem of the so called "strategic patenting" when particularly the large and financially strong enterprises patent even the broad neighbourhood of their inventions with the aim to block the competition, prevent their own blocking and guarantee a dominant position on the international markets for themselves.

The fact is that the national patent system is not conceived basically as a criterion of the national research effectiveness and the quantitative indicators of the number of patent applications or granted patents have only a limited reporting value. Additional problems with interpretation come with the new situation of the Czech Republic within Europe, i.e. our membership in the European Patent Convention. It follows from experiences of countries being the Convention members for a longer time that the decrease in direct foreign applications as a result of the possibility to use the regional European path amounts from 60 % to 80 % of the previous state. But at the same time the number of industrial rights and European patents having effects on the territory of the Czech Republic will grow.

The last year's optimism did not prove true on the basically smooth introduction of the Community Patent, i.e. the centrally granted patent with uniform effects within all EU Member States. The spring European Council meeting in 2004 expressed regret for additional delays and asked the European Commission and Member States to make increased efforts to obviate the persistent barriers to introduction of a single patent.

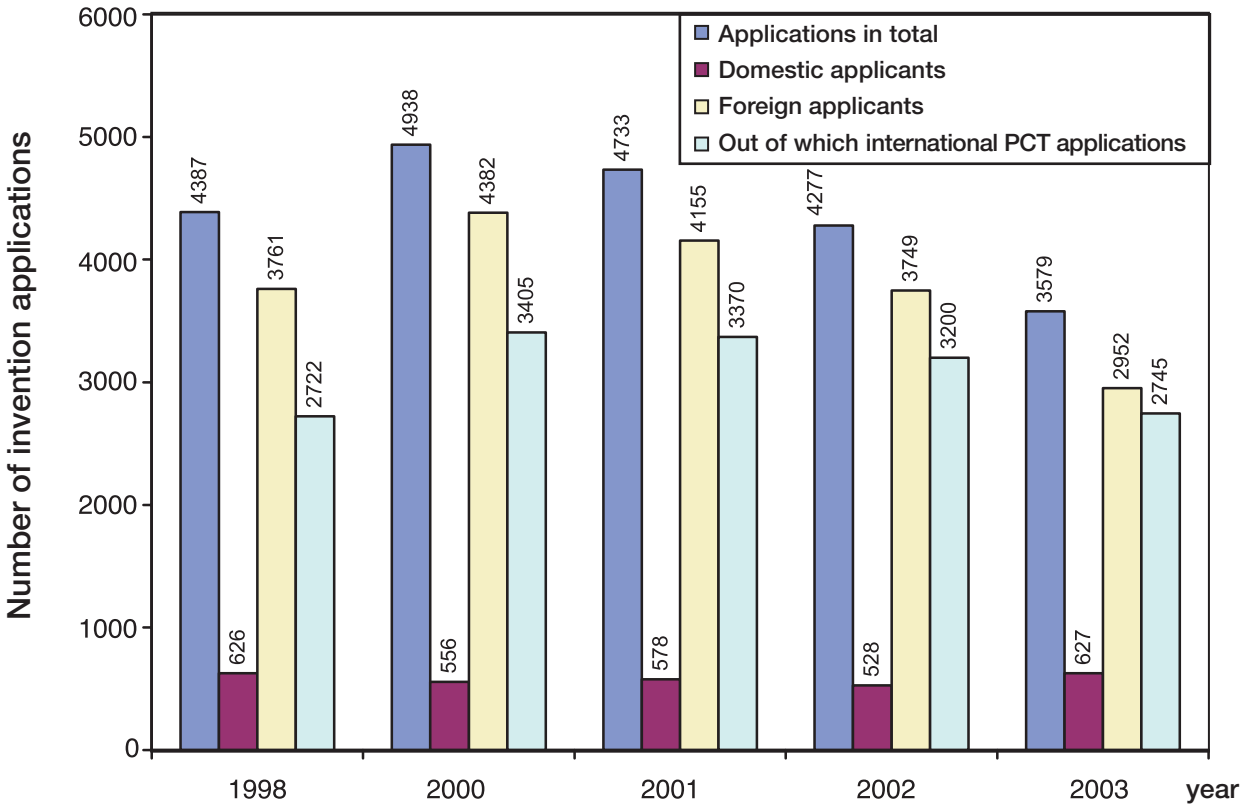
It seems undoubtedly reasonable to use the criterion of a patent application filing, or patent granting respectively as one of the leading evaluating indicators of a result achieved within a concrete research project.

The following seven graphs and one table show the trends of selected indicators. The graphs report the total numbers of applications and granted patents without distinguishing the level of technologies. Table E.8 mentions the patent applications related to high technologies. The high technologies classification is mentioned in Appendix E 1.

- Invention applications filed in the Czech Republic, total numbers
- Invention applications filed in the Czech Republic, total numbers
- Patents granted in the Czech Republic, total numbers
- Patent applications filed with the European Patent Office (EPO), relative numbers per one million inhabitants
- Patents granted by EPO, relative numbers per one million inhabitants
- Patent applications filed with USPTO, relative numbers per one million inhabitants
- Patents granted by USPTO, relative numbers per one million inhabitants
- Table – Patent applications related to high technologies filed with EPO between 1996 and 2001, total numbers

Both the Czech Republic and other new Member States significantly lag behind the EU-15 countries, with the exception of Greece. This lagging behind has several reasons. Among them may be the insufficient level of R&D results; the lack of interest, abilities or resources of the patented results authors or their lacking confidence that they could reach any more significant economic results by this patenting. It is also necessary to take into account the fact that the EPO and USPTO fees are relatively higher for applicants from the new Member States than for those from EU-15 countries, the United States or Japan. This lagging behind also testifies to the unsatisfactory coordination between universities, government research sector and business sphere.

E.1 Invention applications filed in the Czech Republic



Source: IPO Yearbook 2003

Note: International PCT applications – invention applications filed in the PCT (Patent Cooperation Treaty) member states, in which the Czech Republic was designed by the applicant as the country, in which the applicant seeks to obtain protection.

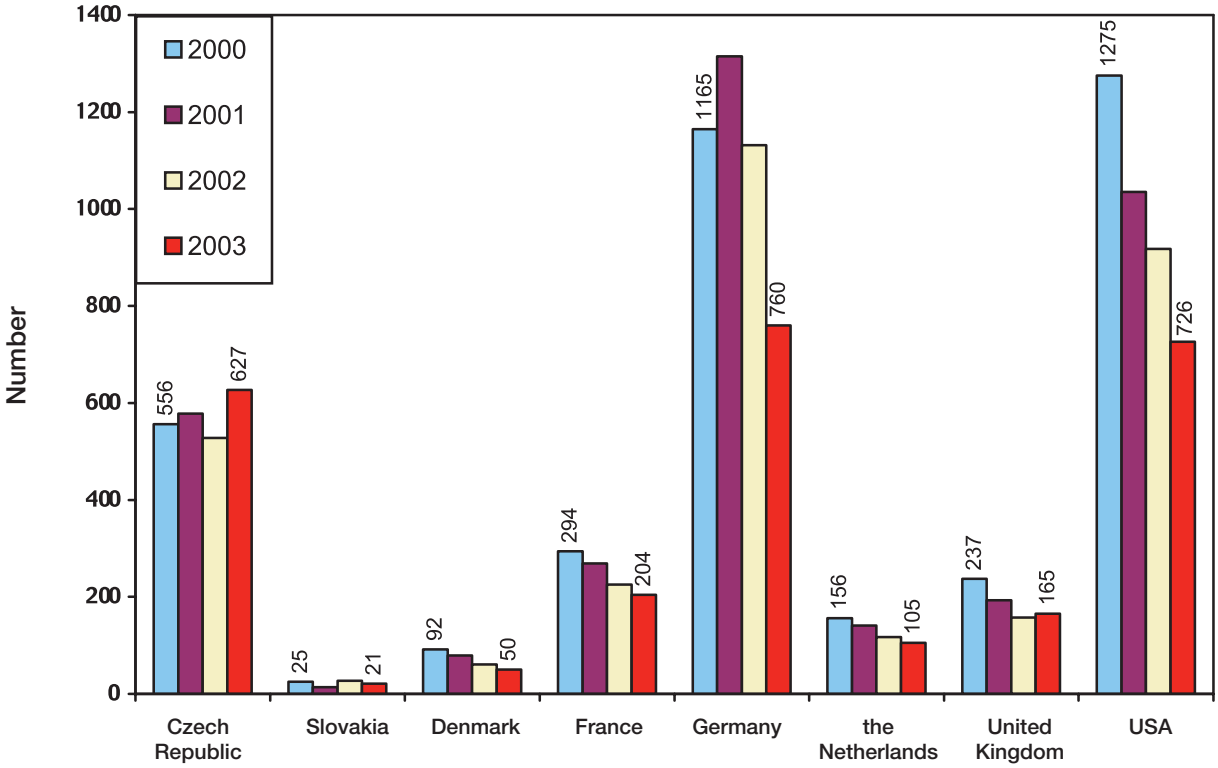
Commentary:

(1) Starting from 2002, as a result of the Czech Republic acceding to the European Patent Convention (effect from July 1, 2002), there has occurred the expected decline in the number of foreign invention applications, and therefore in the total number of invention applications filed in the Czech Republic. Many foreign applicants prefer to reach the patent protection on the territory of the Czech Republic through the European Patent. Similar trends can be observed for all the member countries to the Convention.

(2) The reported data will loose gradually their reporting value. The decline seen in the foreign invention applications filed in the Czech Republic has no direct link to the attractiveness of the Czech Republic for the foreign scientific, industrial and business public. It is the result of the fact that part of the national competence was passed to the European regional body.

(3) The number of applications of domestic applicants increased in 2003 by a gratifying nearly 100 applications against 2002. But it is necessary to mention that already in 1998 the domestic applicants filed 626 applications.

E.2 Invention applications filed in the Czech Republic (number)



Source: IPO Yearbook 2003

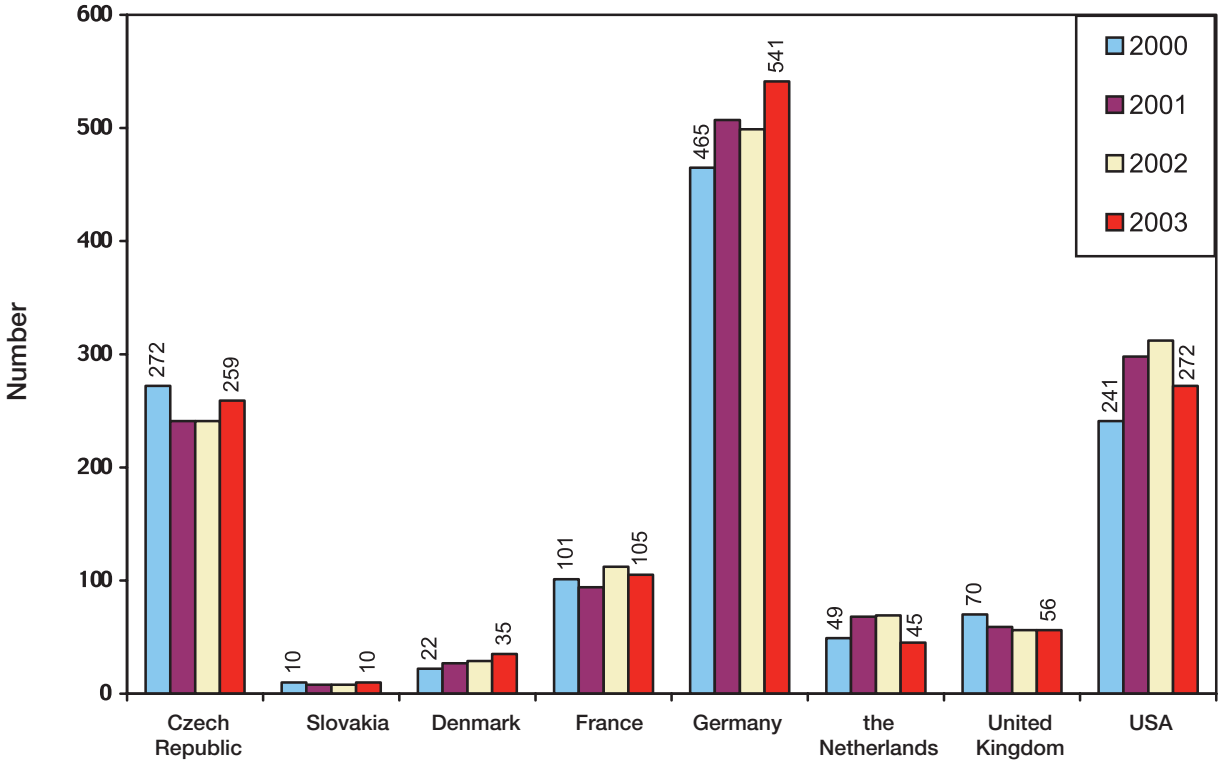
Commentary:

(1) The numbers of invention applications of entities residing in the Czech Republic are slightly increasing, with the exception of 2001. The numbers of applications of entities from Slovakia basically stagnate.

(2) The numbers of invention applications of entities from other monitored countries are rapidly decreasing. In 2000, the numbers of invention applications from Germany and the United States were more than double the number of invention applications of the Czech entities. By 2003 their numbers have fallen nearly to the number of applications from the Czech Republic.

(3) The decline in the number of invention applications filed by foreign entities cannot be explained as a consequence only of these subjects applying for their patents through the Patent Cooperation Treaty with EPO. This decline is caused evidently by the more realistic evaluation of benefits resulting from the industrial rights protection in the Czech Republic.

E.3 Patents granted in the Czech Republic (number)



Source: IPO Yearbook 2003

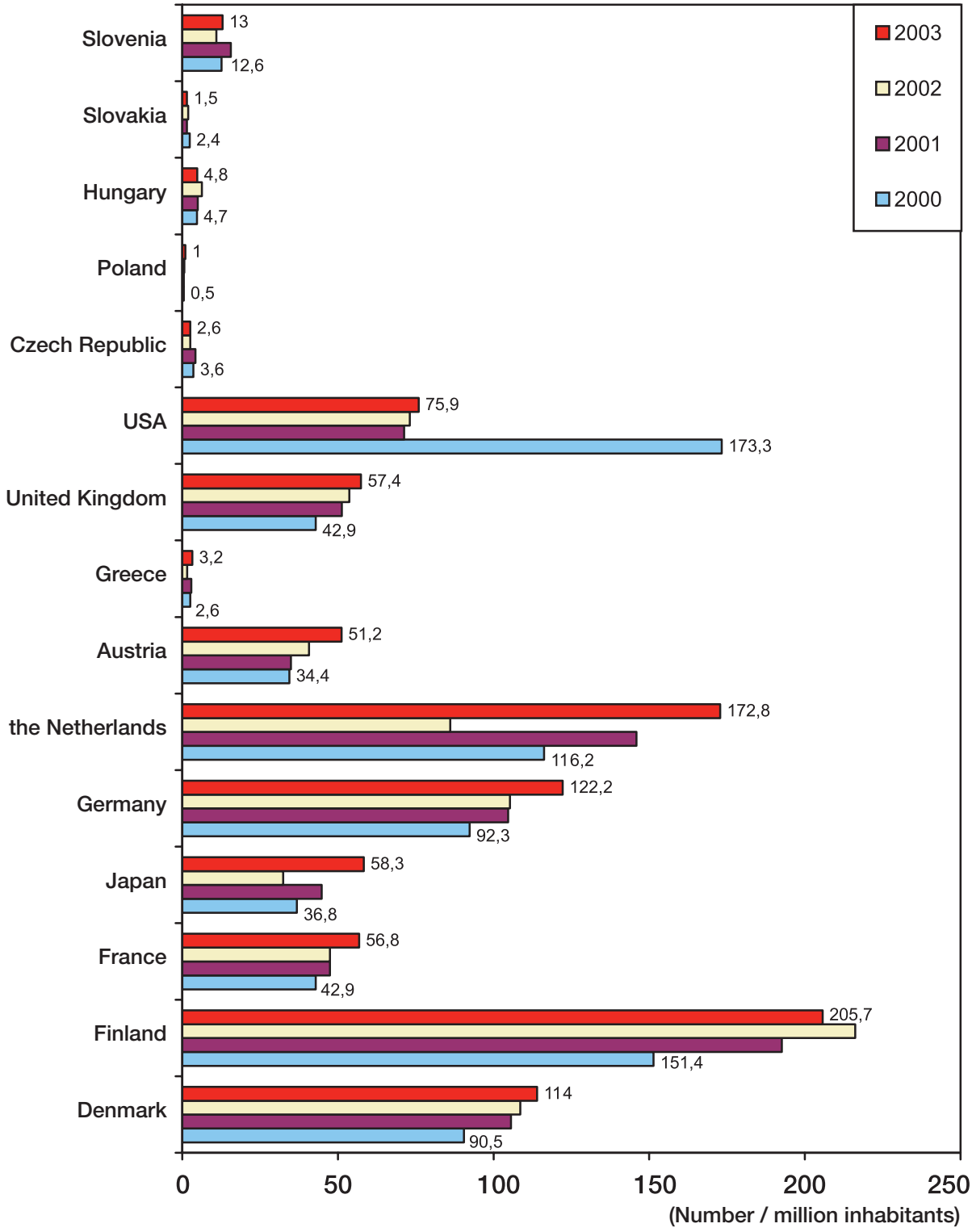
Commentary:

(1) The average term of invention application proceedings is 5 years. The number of really granted patents is less than half of the number of invention applications.

(2) The number of patents granted to entities from the Czech Republic basically stagnates in the monitored period. In 2003 it increased to 259 granted patents. This number, however, lags behind the number of patents granted in 2000 – 272 patents.

(3) The numbers of patents of the leading foreign applicants – Germany and the United States (in 2003, USA experienced a decrease when compared with 2002) were slightly increasing in the monitored period. When taking notice of the fact that numbers of invention applications from the above countries were slightly decreasing in the monitored years (see the graph E.2), a conclusion on the growing "fruitfulness" of the invention applications from these countries may be made with a certain degree of caution.

E.4 Patent applications filed with EPO (number of applications per one million inhabitants)



Source: European Patent Office Yearbooks, 2000 to 2003, Section of Statistics – Total numbers of applications; Research and Development Council – conversions to one million inhabitants according to: Eurostat/U.S.Bureau of the Census; June 2004

Commentary:

(1) No objective conclusions on the inventiveness and innovative potential of the applicant countries can be elicit from information on the trend of the number of invention applications and patents granted by national patent offices of small or medium-sized countries. Certain conclusions can be elicited only on the trends with respective categories of applicants (domestic applicants, applicants from selected countries, etc.).

(2) The inventiveness and innovative potential of individual countries can be inferred, however, from the number of applications and patents granted at the leading patent offices like the European Patent Office (EPO), U.S. Patent and Trademark office (USPTO) and the Japan Patent Office (JPO), with a relatively high rate of objectivity.

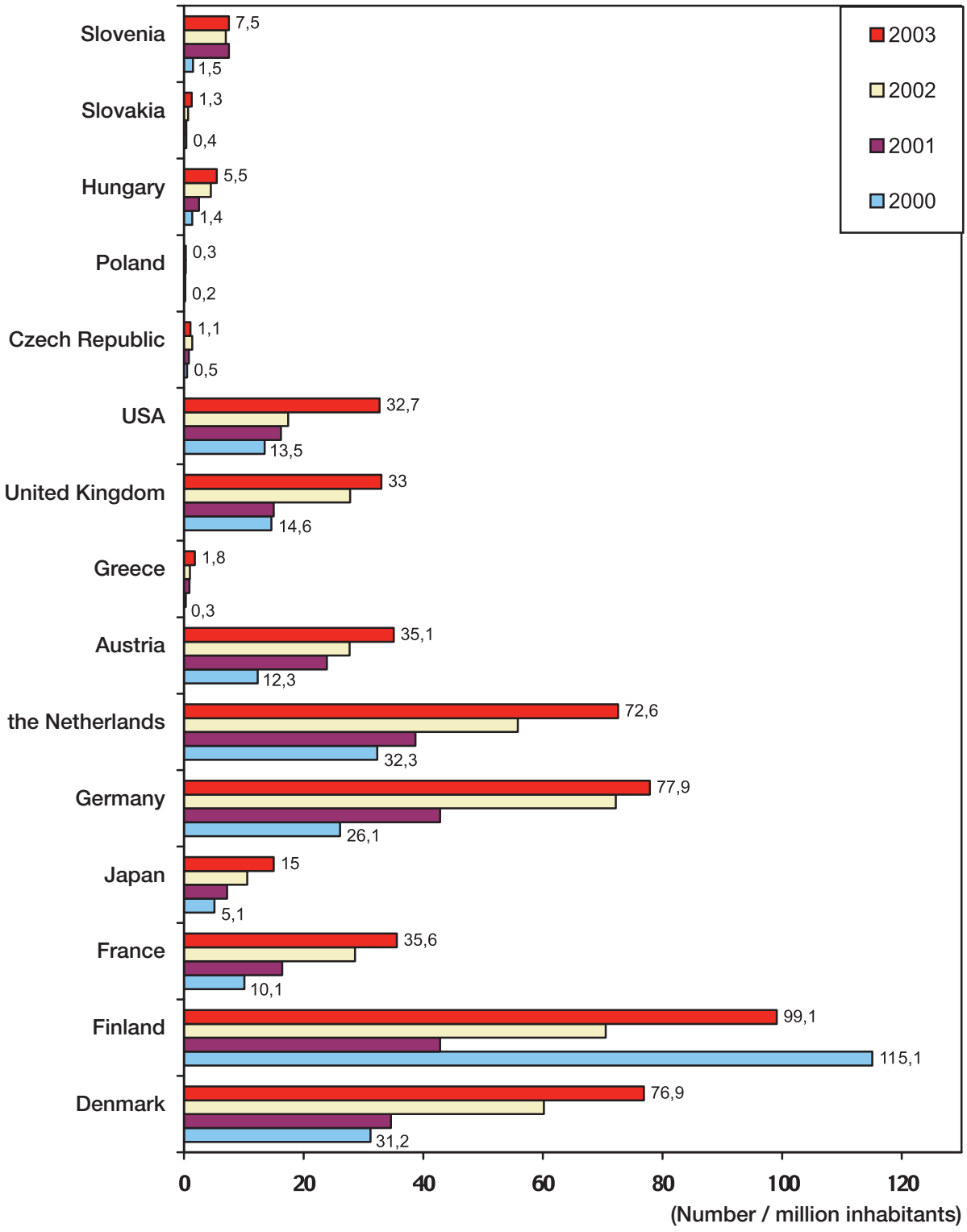
(3) More than 100 patent applications per one million inhabitants in 2003 were filed by entities from Finland (205.7), the Netherlands (172.8), Germany (122.2), and Denmark (114.0). Finland, which already in 2001 reached the level of nearly two hundred of applications per one million inhabitants (192.6), dominates.

(4) The Czech Republic, as well as other countries that became the EU members in 2004, significantly lags behind other monitored countries. Similar situation is in Greece. Most patent applications out of these countries were reported in 2003 by Slovenia (13.0), followed by Hungary (4.8) and the Czech Republic (2.6). The numbers of patent applications from Poland and Slovakia stagnated in the monitored years on the value around one application per on million inhabitants.

(5) Apparently the entities from Japan and USA give their preferences to and apply patents particularly through USPTO and the Japan Patent Office (JPO) (see also Graphs E.6 and E.7).

(6) The countries having a high number of applications and granted patents stand also at the forefront of evaluation of the overall competitiveness (see Chapter G).

E.5 Patents granted by EPO (number of patents per one million inhabitants)



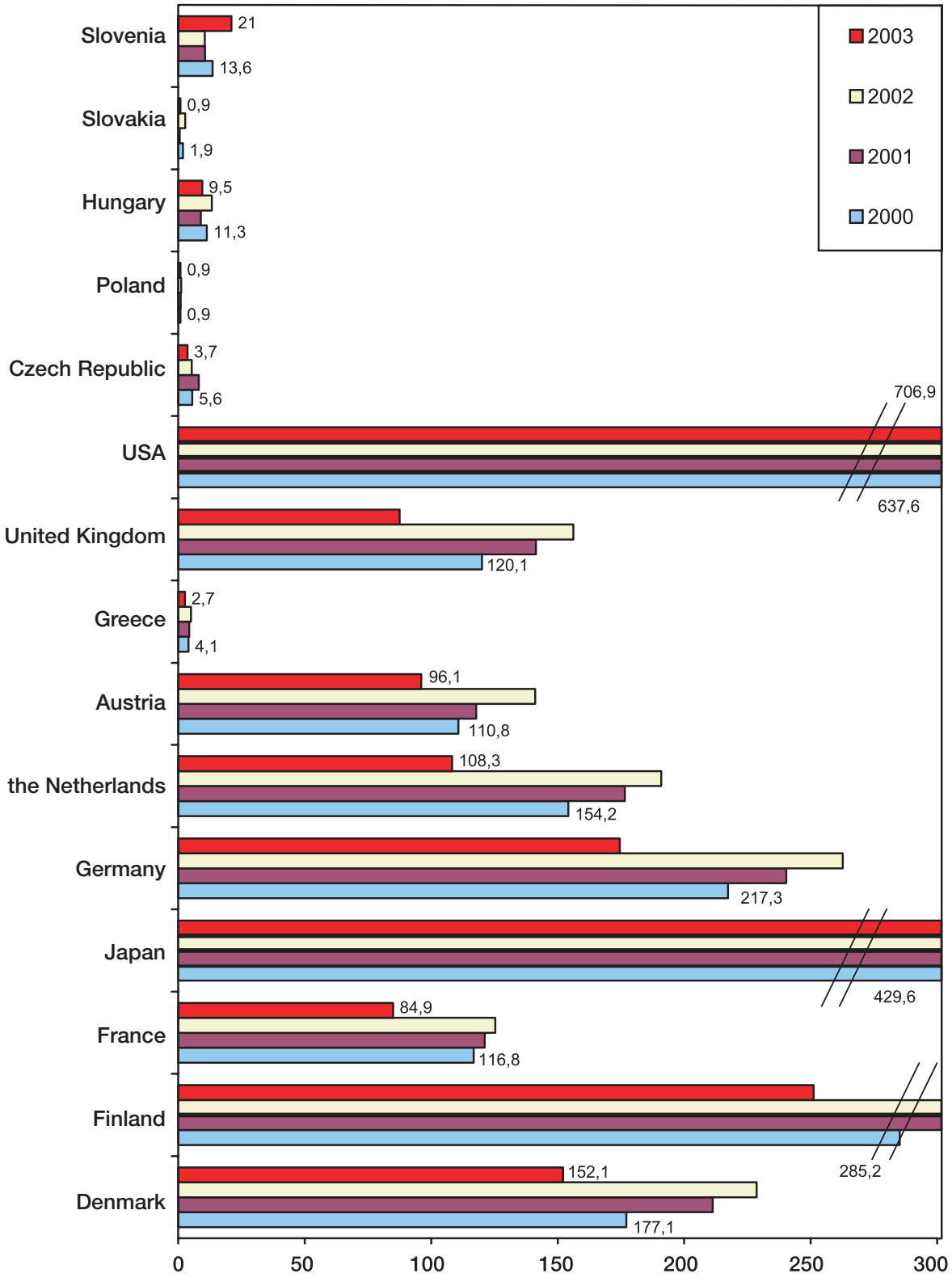
Source: European Patent Office Yearbooks, 2000 to 2003, Section of Statistics – Total numbers of applications; Research and Development Council – conversions to one million inhabitants according to: Eurostat/U.S.Bureau of the Census; June 2004

Commentary:

(1) In general, the numbers of patents actually granted at EPO are in compliance with the numbers of patents applied. Basically the same is also the ranking of countries. With the exception of 2000 Finland takes the first place in all other years of the monitored period, followed by Germany on the second place. As with the number of patent applications the new EU Member States significantly lag behind the monitored economically advanced countries.

(2) Slovenia reports the most granted patents out of the new EU Member States (7.5 patents/million inhabitants in 2003), followed by Hungary (5.5 patents/million inhabitants 2003). With the exception of Poland and Slovakia all monitored new EU Member States report more granted patents than Greece. Considering the very low numbers of patents granted to entities from new Member States it is not possible to make any objective conclusions on the development in the monitored period between 2000 and 2003.

E.6 Patent applications filed with USPTO (number of applications per one million inhabitants)



Source: Number of granted patents according to the United States Patent and Trademark Office "Performance and Accountability Report Fiscal Year 2003". Research and Development Council – conversions to one million inhabitants according to: Eurostat/U.S.Bureau of the Census; June 2004

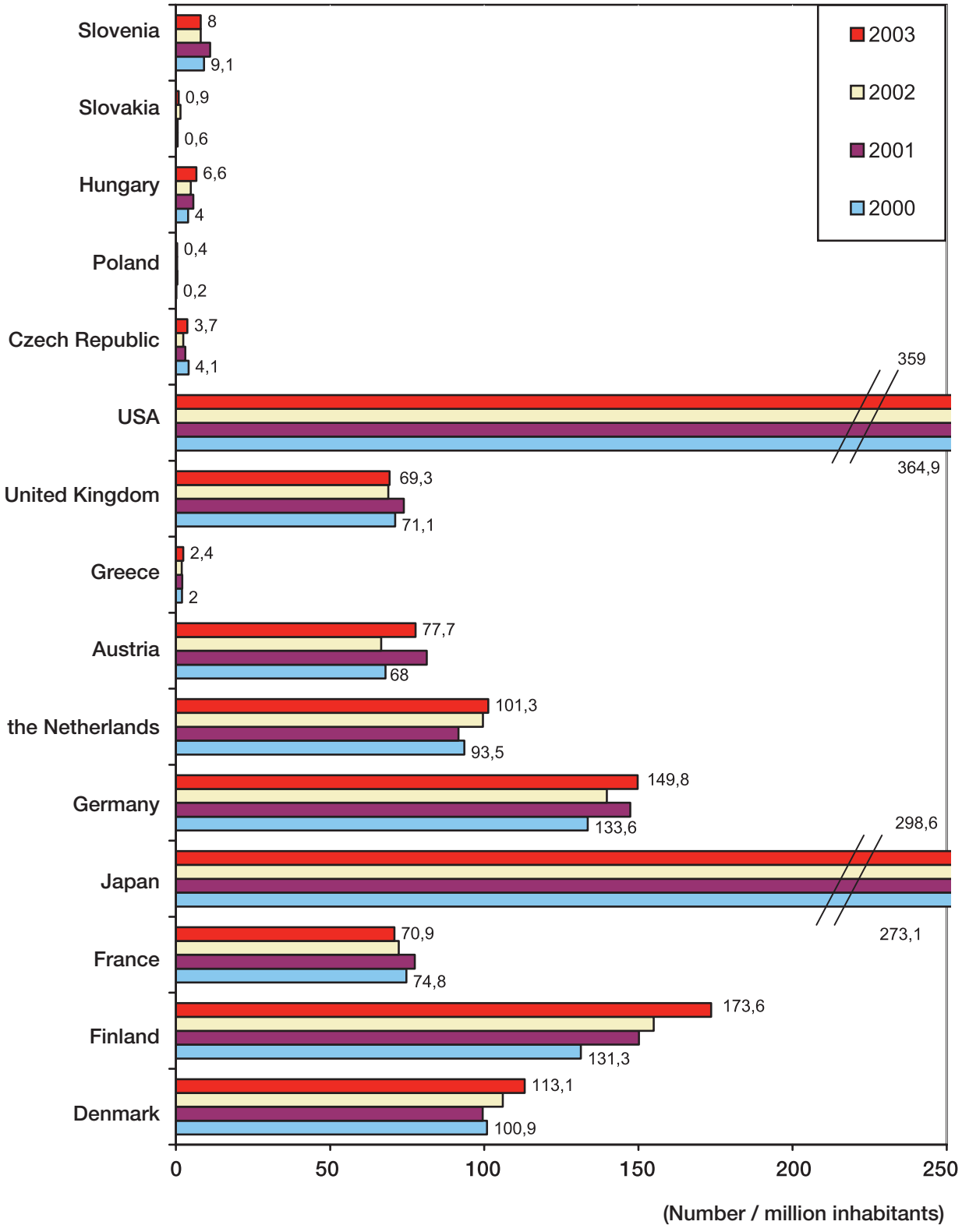
Commentary:

(1) The relative numbers of patents applied through USPTO by applicants from the monitored countries can be interpreted in the main similarly to the patent applications with EPO. The economically advanced countries dominate. As expected, the applicants from the United States stand at the forefront (applications with the national patent office) with 706.9 patents/million inhabitants in 2003, followed by Japan with 360.9 patents/million inhabitants in 2003. In addition, high numbers of applications are reported by Finland, Germany, Denmark, and the Netherlands.

(2) Slovenia is the best among the monitored new EU Member States with 21 patents/million inhabitants in 2003, followed by Hungary with 9.5 patents/million inhabitants and the Czech Republic with 3.7 patents/million inhabitants. With the exception of 2001 Hungary reports more than double the number of patent applications of the Czech Republic in the monitored period between the years 2000 and 2003.

(3) With the exception of USA and Slovenia all monitored countries experienced a decrease in the number of patent applications in 2003 against 2002. Particularly significant decrease in the number of applications took place in France and the Netherlands.

E.7 Patents granted by USPTO (number of patents per one million inhabitants)



Source: Number of granted patents according to the United States Patent and Trademark Office "Performance and Accountability Report Fiscal Year 2003". Research and Development Council – conversions to one million inhabitants according to: Eurostat/U.S.Bureau of the Census; June 2004

Commentary:

(1) To a certain extent the numbers of patents granted by USPTO can be interpreted similarly to the numbers of patent applications through USPTO. Maybe only the ratio of patents granted to patents applied is more favourable for the best European countries than for USA and Japan; as if the applicants from these European countries were "more successful" than the American and Japanese applicants.

(2) Finland was dominant among the monitored European countries throughout the whole period between 2000 and 2003 (with numbers of granted patents around 150 patents/million inhabitants), followed by Germany and Denmark.

(3) Slovenia is again the most successful out of the new EU Member States, followed by Hungary and Czech Republic. In the number of granted patents these three countries achieved better results than Greece.

(4) As far as the share of patents granted to the applicants from Hungary and Czech Republic is concerned, this share is somewhat lower than with the patent applications; applicants from Czech Republic are relatively "more successful" than applicants from Hungary.

E.8 Patent applications related to high technologies filed with EPO between 1996 and 2001

Commentary:

(1) The patent applications related to high technologies are more representative indicator of the level of research in a given country than the total numbers of patent applications. More frequently they are the result of research and development than other patents. The classification of patents related to high technologies is referred to in Appendix E-1.

(2) In the number of patent applications related to high technologies Finland is markedly the superior one (136 patents/million inhabitants in 2001), followed by the Netherlands (69 patents/million inhabitants) and USA (57 patents/million inhabitants).

(3) New EU Member States significantly lag behind the monitored economically advanced countries. Neither Slovenia attained in 2001 the average of the existing EU-25 in the number of patent applications related to high technologies: Slovenia – 9 patents/million inhabitants; EU-25 – 26 patents/million inhabitants. In the number of patent applications related to high technologies the Czech Republic lags behind Hungary, as well as in the total number of applications and granted patents of all sectors.

(4) In all countries with the exception of the Czech Republic the share of patent applications related to high technologies in the total number of applications increased in 2001 in comparison with 1996. In EU-25 the share increased from 12 % in 1996 to 20 % in 2001, in the Czech Republic on the contrary it declined from 9 % in 1996 to 6 % in 2001. The highest share of patent applications related to high technologies reports again Finland (40 % in 2001).

(5) With most of the countries the first place according to the number of applications is taken by "Communication technologies", both with EU-25 and Japan. „Data processing and office technology" takes the second place. Only with the United States the situation is just the opposite. It is, however, necessary to mention that the U.S. patent law permits to patent also algorithms and commercial methods. For majority of the monitored countries even in EU-25 the third place is occupied by biotechnology and gene technologies.

Source: Eurostat; Statistik kurz gefasst 8/2004 Spitzentechnologie und Wissenintensität bringen Wertschöpfung, Innovation und Patente mit sich

	Patent applications related to high technologies						Aviation and cosmonautics		Communication technologies		Data processing, office technology		Lasers		Biotechnology and gene technologies		Semiconductors	
	Total number		In % of the total number of applications of all patents		Average annual increases in % / year	Number per one million inhabitants	Number		Number		Number		Number		Number		Number	
	2001	1996	2001	1996			2001	1996	2001	1996	2001	1996	2001	1996	2001	1996	2001	1996
EU-25	12 017	4 385	20	12	22	26	148	73	5 656	2 117	3 428	947	163	100	1560	679	1 062	469
Czech Republic	7	5	6	9	9	1	1	-	1	2	3	1	-	-	2	2	-	-
Denmark	225	68	20	10	27	42	1	1	76	18	60	3	2	-	82	45	4	1
Finland	705	250	40	28	23	136	-	-	568	214	108	13	1	-	24	17	6	6
France	1 791	716	21	12	20	30	41	24	824	305	563	180	25	29	212	106	126	71
Hungary	43	9	23	7	40	4	-	-	24	5	15	1	-	-	3	2	1	1
Germany	4 017	1 338	16	9	25	49	66	29	1 713	584	987	296	67	38	607	178	576	214
the Netherlands	1 100	357	28	17	25	69	2	-	581	178	294	63	1	8	102	65	119	43
Poland	8	1	8	2	72	0	1	-	3	-	2	1	-	-	2	-	-	-
Austria	152	61	11	8	20	19	2	3	60	24	39	18	3	1	26	10	23	5
Greece	22	3	27	6	50	2	1	-	6	2	10	1	-	-	2	1	3	-
Slovakia	6	1	18	9	19	1	-	-	3	-	1	-	-	-	1	2	1	1
Slovenia	17	1	21	4	63	9	-	-	10	-	4	-	-	-	3	1	-	-
United Kingdom	2 134	799	27	17	22	36	19	10	890	394	823	181	40	20	279	155	83	38
Japan	5 707	2 787	26	22	15	45	16	5	2 177	1 004	1 995	968	132	57	481	248	908	506
USA	15 839	6 252	34	22	20	57	125	99	4 881	2065	6 572	2 156	240	90	2 697	1 119	1 324	722

Source: Eurostat; Statistik kurz gefasst 8/2004 Spitzentechnologie und Wissenintensität bringen Wertschöpfung, Innovation und Patente mit sich

Symbol " – " – data are not available

F. Use of venture capital

Various definitions of venture capital usually agree on its common definition to be a tool for financing enterprises (companies) not publicly traded on stock markets by form of investments into creation or increase in their basic capital. This financing provides capital necessary for starting up the activity, its development, expansion or buyout of the whole company. Venture capital as strictly defined includes the investments of initial capital into the seed and start up phases of the firm and capital investments into the expansion phase. The venture capital investors search for new companies and new business activities promising considerable increase in the value of the invested means in the future, even when their financing is risky. These new companies are established mostly in high-tech industries and in the knowledge-intensive sectors of economy. Together with funds making possible the realisation of new ideas and further growth the venture capital investor brings also a know-how and management support. The venture capital investors are mostly the venture capital funds.

In the area of venture capital EU is still lagging behind USA. At present, the amount of venture capital investments in EU-25 moves roughly at one half of the level of these investments in USA. Between the years 2001 and 2002 the venture capital investments experienced a marked decline both in USA and EU-25. The term “crisis of new economy“ becomes quite common for this period in the professional literature. In the new EU Member States the level of these investments is especially low, also in connection with the insufficiently developed markets for this type of capital.

There are substantial differences between individual countries depending on their size and traditions. But their common feature is the orientation of venture capital investments into the phase of expansion having lower degree of technological and market uncertainty and higher promises of profit. At present, ca two thirds of venture capital investments in EU-25 are directed into the expansion phase. The countries with the highest actual share of venture capital investments into the early phases (for GDP) are the Scandinavian countries and Japan.

In the Czech Republic the venture capital investments are still rather a marginal form of private financing and their amount was quite fluctuating over the last years. The share of investments into the expansion phase is rising up to the detriment of investments into the early phases which are critical for commercionalisation of research information and created knowledge.

F.1 Use of venture capital for early stages of business (establishment of new enterprises and their early development) (% of GDP)

	1998	2000	2001	2002
Czech Republic	0.009	0.026	0.010	0.001
Poland	0.029	0.023	0.012	0.005
Hungary	0.000	0.003	0.027	0.003
Slovakia	0.004	0.000	0.012	0.003
EU-15	0.020	0.075	0.045	0.029
Finland	0.008	0.104	0.104	0.071
Denmark	0.008	0.020	0.085	0.075
France	0.020	0.081	0.038	0.032
Germany	0.024	0.081	0.056	0.027
The Netherlands	0.048	0.093	0.043	0.045
Austria	0.006	0.029	0.020	0.013
Greece	0.004	0.007	0.024	0.009
United Kingdom	0.014	0.103	0.058	0.036
USA	0.083	0.298	0.099	0.045

Source: Eurostat; original source: EVCA, Price Waterhouse Coopers

Commentary:

(1) Venture capital represents a significant source of seed and start up capital only in USA, Finland, the Netherlands, and the United Kingdom. In most of the monitored countries the maximum investments of venture capital took place in 2000, followed by smaller or larger declines over the next years. A certain exception is Denmark which experienced an increase in 2001 against 2000 (from 0.02 % of GDP in 2000 to 0.085 % of GDP in 2001) and in 2002 the expenditures remained at the level of 0.075 % of GDP being the highest value of all monitored countries in that year.

(2) The venture capital investments into seed and start up phases are only negligible in the Czech Republic; in 2002 they were the lowest (0.001 % of GDP) of all the monitored countries.

(3) It follows from surveys made in EU and elsewhere in the world that the lack of finance is one of the main barriers to establishment of new enterprises and introduction of innovations in high-tech industries. Despite all the attention dedicated by the EU bodies to the employment of the venture capital sources, the situation remains bleak. The venture capital funds explain their lowering interest by a considerable amount of risk present in individual cases, lack of experts for evaluation and monitoring of investment and low volumes of requested financial resources. Recently, the EU bodies have been searching intensively for possibilities of any change for the better. In particular, this means better framework conditions for operation of the venture capital sources. This is obviously also the question of strengthening the public private partnerships while using venture capital for the seed and start up phases.

F.2 Use of venture capital for expansion stages (% of GDP)

	1998	2000	2001	2002
Czech Republic	0.006	0.176	0.029	0.035
Hungary	0.087	0.057	0.018	0.022
Slovakia	0.007	0.007	0.025	0.008
EU-15	0.068	0.154	0.098	0.081
Finland	0.046	0.089	0.055	0.139
Denmark	0.017	0.092	0.095	0.053
France	0.054	0.150	0.054	0.057
Germany	0.048	0.112	0.079	0.038
The Netherlands	0.187	0.248	0.295	0.200
Austria	0.013	0.043	0.041	0.046
Greece	0.014	0.151	0.053	0.023
United Kingdom	0.149	0.294	0.133	0.136
USA	0.161	0.784	0.308	0.174

Source: Eurostat; original source: EVCA, Price Waterhouse Coopers

Commentary:

(1) In the scope being significantly higher than for the establishment and development of new enterprises, venture capital is used for financing the expansion of existing enterprises. High level of these venture capital investments is maintained throughout the entire period by USA (0.784 % of GDP in 2000), followed by the Netherlands and United Kingdom with expenditures of nearly 0.3 % of GDP in 2001, or 2000 respectively.

(2) In 2000, USA reported the highest investments of venture capital into expansion of all the monitored countries, 0.784 % of GDP. Step by step the venture capital investments in many countries are declining, but the number of countries neither the rate of decline are as high as with the seed and start up money.

(3) The relative level (in % of GDP) of the venture capital investments in the Czech Republic, Hungary and Greece is approaching the level of investments in Austria and France, but it is still substantially lower than in other monitored countries.

G. Competitiveness, innovations

The multicriterion evaluation of competitiveness of national economies resulting in compilation of various top lists of countries are intended mostly for the needs of foreign investors (telling them where to invest), but at the same time they represent for each country a sort of label for perceiving its credibility, reputation and willingness to conform to the global economy rules. Such evaluations establish the competition of the states for favour of the investing economic subjects.

Following two regular annual multicriterion evaluations of competitiveness are the most renowned in the world: Global Competitiveness Report published jointly by the World Economic Forum and Harvard University, and World Competitiveness Yearbook published by the International Institute for Management Development (IMD) in Lausanne.

On one hand the evaluations are based on "hard" data taken from the international, national and regional statistics and on the other hand on "soft" data received on the basis of questionnaire surveys (respondents being the representatives of top management of companies active in a particular country, selected experts). Soft data, the share of which rises with the growth of indicators used for evaluation, report basically on the perception of a certain side of competitiveness by particular respondents. The risks of distortion lie particularly in the fact that each respondent evaluates the competitiveness of only one country. There can be various reserves as to the evaluation, but it must be take into account that this way the Czech Republic is perceived and evaluated in abroad.

The certain problem of used time lines is that over the last years both the numbers of monitored countries and numbers of ascertained and measured criteria (indicators) have been gradually enlarged.

In the long term the Czech Republic finds itself on the frontier between the developed and developing countries. Its position has been moderately rising over the last years, but in 2003 it experienced a certain decline. Its position is favourably influenced by the technological level of economy and macroeconomic indicators, but on the other hand it is pulled down to lower places particularly by functioning and strategy of business and extraordinarily unfavourable perception of the quality of public institutions, connected also with the image of massive proliferous corruption.

A certain form of evaluation of competitiveness in a selected area represents the evaluation of the innovation efficiency and innovation potential of the national economies (European Innovation Scoreboard).

G.1 Competitiveness according to the Global Competitiveness Report – for the World Economic Forum

It has been compiled for the World Economic Forum annual meetings since 1979. The compilation of the last issue involved the work of ca 2000 experts from all over the world. One hundred and two countries were evaluated. The methodology is a relatively complex one going through a gradual evolution.

The competitiveness is measured by several dozens of criteria in total; the share of survey questions is relatively high.

The Current Competitiveness Index and Growth Competitiveness Index are defined. The total Growth Competitiveness Index is calculated from three component indexes: the public institutions level, the macroeconomic environment level, and the technology level. The component index of the technology level is composed of three sub-indexes: innovation – 6 criteria (4 survey questions, 2 quantitative figures); information and communication technology (ICT) – 10 criteria (5 survey questions, 5 quantitative figures); technology transfer – 2 criteria (2 survey questions). So the technology level is evaluated by 18 criteria in total.

Countries are divided into two groups: group of “core innovators” reporting more than 10 patents granted by the U.S. Patent and Trademark Office (USPTO) per 1 million inhabitants; and other countries. For each of the above groups the technology index is calculated in a slightly different way. For details on the methodology see www.weforum.org.

G.1.1 Total Growth Competitiveness Index – 2001 to 2003 (rankings in the list of 102 countries[1])

	2001	2002	2003
Finland	1	1	1
Denmark	14	4	4
France	20	28	26
Germany	17	14	13
the Netherlands	8	13	12
Austria	18	18	17
Greece	36	31	35
United Kingdom	12	11	15
Czech Republic	37	36	39
Hungary	28	29	33
Poland	41	50	45
Slovakia	40	46	43
Slovenia	31	26	31
USA	2	2	2
Japan	21	16	11

1) In 2001 and 2002 the number of evaluated countries was smaller.

Commentary:

(1) Over the three evaluated years the winners are the same: 1. Finland; 2. USA. The gradual and marked improvement shows Japan, from 21st place in 2001 to 11th place in 2003. Remarkable is the improvement of Denmark from 14th place in 2001 to 4th place in 2002 and keeping of this top position also in 2003.

(2) Slovenia is the best out of the monitored countries which became the EU members in 2004 (31st place – 2001; 26th place – 2002; 31st place – 2003), followed by Hungary and the Czech Republic (37. – 2001; 36. – 2002; 39. – 2003). In these three evaluated years Slovenia and Hungary outdid Greece.

G.1.2 Total Growth Competitiveness Index and component indexes in 2003 (rankings in the list of 102 countries)

	Total index	Public Institutions	Macro-economy	Technology
Finland	1	2	2	2
Denmark	4	1	5	8
France	26	23	20	28
Germany	13	9	21	14
the Netherlands	12	11	9	18
Austria	17	14	10	27
Greece	35	42	33	30
United Kingdom	15	12	12	16
Czech Republic	39	47	39	21
Hungary	33	33	38	32
Poland	45	58	49	34
Slovakia	43	51	50	33
Slovenia	31	35	37	24
USA	2	17	14	1
Japan	11	30	24	5

Commentary:

(1) In all three component indexes in 2003 Finland took the second place. In all three component indexes Denmark took place in the top ten: public institutions – 1st place; macroeconomy – 5th place; technology – 8th place.

(2) As regards the technology USA (1st place) and Japan (5th place) are at the forefront. With other two indexes - public institutions and macro-economy – USA finished in the second ten and Japan in the third ten.

(3) Hungary was best among the new Member States in the evaluation of public institutions (33rd place), followed by Slovenia (35th place) and Czech Republic (47th place). Slovenia is the best in the macro-economy evaluation (37th place), followed by Hungary (38th place) and the Czech Republic (39th place). The Czech Republic is the best in the evaluation of technology (21st place), followed by Slovenia (24th place) and Poland (32nd place). It is necessary to remark that in the evaluation of the technology level a great weight is given to the indicator of foreign investments volume in a particular country. Here the Czech Republic gains important points to loose them by return as a result of the incomparably lower innovation activity.

(4) With the exception of Hungary and Slovenia other new member states show the worst rankings in the evaluation of public institutions: Poland (58th place); Slovakia (51.); Czech Republic (47.). This indicator puts a great weight on the survey evaluation of corruption in a particular country.

G.1.3 Technology Index and its three sub-indexes in 2003 (rankings in the list of 102 countries)

	Technology (in total)	Innovation	ICT	Technology transfer
Finland	2	3	2	-
Denmark	8	11	4	-
France	28	19	23	-
Germany	14	10	17	-
the Netherlands	18	14	15	-
Austria	27	20	22	-
Greece	30	31	33	27
United Kingdom	16	13	16	-
Czech Republic	21	45	30	5
Hungary	32	38	35	21
Poland	34	29	41	26
Slovakia	33	44	37	16
Slovenia	24	23	26	51
USA	1	1	5	-
Japan	5	5	18	-

Commentary:

(1) Technology Index is evaluated by three sub-indexes: innovation, information and communication technology – ICT and technology transfer. The transfer technology sub-index, given mostly by the volume of foreign investments in a particular country, is evaluated only for countries reporting less than 10 patent applications filed with the U.S. Patent and Trademark Office (USPTO). The Czech Republic ranks 5th and from this view it has a markedly superior position among the EU Member States.

(2) Places in the top ten as far as the innovation sub-index is concerned were taken by USA (1st place), Finland (3rd place) and Japan (5th place). Out of the new EU Member States, Slovenia is the best (23rd place), followed by Poland (29th place) and Hungary (38th place). Out of the monitored new EU Member States the Czech Republic was the worst one (45th place).

(3) In the information and communication technology sub-index places in the top ten were taken by Finland (2nd place), Denmark (4th place) and USA (5th place). Slovenia is the best among the new EU Member States (26th place), followed by the Czech Republic (30th place) and Hungary (35th place). Out of the monitored new EU Member States, Poland was the worst (41st place).

G.2 Competitiveness according to the World Competitiveness Yearbook 2004 of the Swiss IMD

The Swiss International Institute for Management Development (IMD) evaluated the competitiveness of 60 countries and regional economies by more than 320 criteria arranged into four blocks: economic performance – 83 criteria; government efficiency – 77 criteria; business efficiency – 69 criteria; infrastructure – 94 criteria. When compared with the competitiveness evaluation for the World Economic Forum the Swiss IMD institute uses more quantitative criteria, nevertheless the share of survey "soft" data in evaluation is relatively high.

The infrastructure is divided into five sub-groups: basic infrastructure; technological infrastructure; scientific infrastructure; health and environment; education.

The infrastructure of science is measured by 21 criteria (17 quantitative; 4 survey questions); technological infrastructure has 22 criteria (18 quantitative; 4 survey questions). For the details on methodology see www.imd.ch/wcy/tour.

The Institute cooperates with research workplaces in 60 countries and regions. In the Czech Republic it cooperates with CERGE-EI – the joint workplace of the Charles University in Prague and Economics Institute of the Academy of Sciences of the Czech Republic.

G.2.1 Total competitiveness (rankings in the group of 60 countries[1])

	2001	2002	2003	2004
Finland	5	3	3	8
Denmark	15	6	5	7
France	25	25	23	30
Germany	13	17	20	21
the Netherlands	6	4	13	15
Austria	14	15	14	13
Greece	31	36	42	44
United Kingdom	17	16	19	22
Czech Republic	35	32	35	43
Hungary	30	30	34	42
Poland	47	45	55	57
Slovakia	41	38	46	40
Slovenia	38	35	40	45
USA	1	1	1	1
Japan	23	27	25	23

1) 60 countries were evaluated only in 2004; in the previous years the numbers were smaller.

Commentary:

(1) IMD is arriving at somewhat different results – other ranking of countries – than experts for the World Economic Forum meetings. In all evaluated years Finland was in the top ten – in 2002 and 2003 on third place, in 2004 it went down to eight place. At the forefront there is – like in the evaluation for the World Economic Forum – Denmark, with the exception of 2001 (15th place), in other years it moves around the sixth place.

(2) IMD also differs in evaluation of the position of Japan. Experts for the World Economic Forum arrived a conclusion on the gradual marked improvement of its total competitiveness. In the opinion of IMD this improvement is very slow.

(3) The monitored new member states report basically the similar ranking as in the evaluation for the World Economic Forum. But in the first three years of evaluation (2001 to 2003) Slovenia was not the superior one, but Hungary. Hungary, however was outdone in 2004 by Slovakia (40th place); Hungary (42nd place).

(4) Between the years 2002 and 2004 all monitored new Member States, with the exception of Slovakia, experienced a significantly worsening of their position; the Czech Republic from 32nd to 43rd place. Hungary from 30th to 42nd place and Slovenia from 35th to 45th place.

G.3 European Innovations Scoreboard

This Scoreboard is published annually by the European Commission. The Scoreboard and its methodology was developed on the grounds of the European Council request announced on the Lisbon spring meeting in 2000. It should contribute to the so called open method of coordination of national policies within EU. The European Innovation Scoreboard is an effective tool for benchmarking innovation policies.

The methodology is going through gradual adaptations. In 2003 the EU-15 Member States, candidate and associated countries, USA and Japan were evaluated by means of 22 indicators divided into four basic groups. The evaluation was made for individual indicators and their trends; measured was also the total innovation index and its trends. Values of most of the indicators were for 2002. Some countries did not have all indicators available.

The target is not to determine the ranking of countries, but to search for the causes both of success and backwardness, and ways for applying the best approaches while respecting the specifics of each country.

The following table gives four groups of indicators used for evaluation.

Human Resources	**Knowledge creation**	**Transmission and application of knowledge**	**Innovation: finance, outputs, markets**
New Science&Engineering graduates	Public R&D expenditures	SMEs innovating in-house (manufacturing)	High-tech venture capital investment
Population with tertiary education	Business expenditure on R&D	SMEs innovating in-house (services)	New capital raised on stock markets
Participation in life-long learning	EPO high-tech patent applications	SMEs involved in innovation co-operation (manufacturing)	Percentage of “new to market” product sales (manufacturing)
Employment in medium-high and high-tech manufacturing	USPTO high-tech patent applications	SMEs involved in innovation co-operation (services)	Percentage of “new to market” product sales (services)
Employment in high-tech services	EPO patent applications	Innovation expenditures (manufacturing)	Percentage of “new to firm” product sales (manufacturing)
	USPTO patent applications	ICT expenditures	Percentage of “new to firm” product sales (services)
			Internet access and use
			Innovation expenditures (services)
			Percent of manufacturing value-added from high technology [a)]
			Increase in the number of SMEs (manufacturing)
			Increase in the number of SMEs (services)

a) Economic Value Added (EVA) - indicator very frequently used in abroad for measuring the performance of enterprises. EVA is defined as a difference between profit/loss after taxation and cost of capital.

The meaning of indicators for individual groups of indicators is mentioned below. For precise definitions and explanation of methodology see http://trendchart.cordis.lu

G.3.1 Human resources

	EU15	FI	DK	F	DE	NL	A	GR	UK	CZ	HU	SK	SI	US	JP
New Science&Engineering graduates [b]	11,3	**16,0**	11,1	**19,6**	*8,0*	6,1	7,2	–	**19,5**	*5,6*	*3,7*	*7,4*	*8,2*	10,2	–
Population with tertiary education [c]	21,5	**32,4**	**27,4**	23,5	22,3	24,9	*16,9*	17,6	**29,4**	*11,8*	*14,1*	*10,8*	*14,8*	**37,3**	**33,8**
Life-long learning [d]	8,4	**18,9**	**18,4**	*5,0*	5,2	**16,4**	7,5	*1,2*	**22,3**	*6,0*	*3,3*	9,0	*5,1*	–	–
Employment in medium-high and high-tech manufacturing [e]	7,41	7,39	6,33	*5,35*	**11,4**	*4,49*	6,59	*2,20*	6,72	**8,94**	8,5	8,21	**9,28**	–	–
Employment in high-tech services [f]	3,57	**4,74**	**4,74**	*2,50*	3,33	**4,40**	3,47	*1,76*	**4,47**	3,09	3,06	*2,83*	*2,35*	–	–

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

b) Share of Science&Engineering graduates in the overall number of inhabitants of 20-29 years age class (in %)
c) Share of population with tertiary education in the overall number of inhabitants of 25–64 years age class (in %).
d) Share of employees taking part in any life-long learning activity in last four weeks preceding the survey in the overall number of employees of 25–64 years age class (in %).
e) Share in the overall employment in the manufacturing industry (in %).
f) Share in the overall employment in services (in %).

Commentary:

(1) In the area of human resources Finland and the United Kingdom have 4 indicators with value by more than 20 % higher than the EU average; Denmark has 3 such indicators, and the Netherlands 2.

(2) Most S&E graduates are reported by France (19.6 %), closely followed by the United Kingdom (19.5 %). More than 30 % of population with tertiary education in 25-64 years age class is in the United States (37.3 %), Japan and Finland. The highest share of employees participating in the life-long learning is reported by the United Kingdom (22.3 %). By more than 20 % higher employment in medium-high and high-tech manufacturing than the EU average is in Germany, Slovenia and the Czech Republic. By more than 20 % higher employment in high-tech services than the EU average is in Finland, Denmark and the United States.

(3) Of the monitored four new EU Member States (Czech Republic, Hungary, Slovakia and Slovenia) the above average figure (by 20 % higher than the EU average) is reported only by the Czech Republic with the indicator “employment in the medium-high and high-tech manufacturing”.

G.3.2 Knowledge creation

	EU15	FI	DK	F	DE	NL	A	GR	UK	CZ	HU	SK	SI	US	JP
Public R&D expenditures (% of GDP)	0,69	**1,02**	0,75	**0,83**	0,73	**0,83**	0,65	*0,48*	0,65	*0,52*	0,57	*0,22*	0,69	0,76	0,81
Business expenditure on R&D (% of GDP)	1,30	**2,47**	**1,65**	1,37	**1,76**	1,08	1,13	*0,19*	1,19	*0,78*	*0,38*	*0,45*	*0,94*	**2,04**	**2,28**
EPO high-tech patent applications[g)]	31,6	**136,1**	**42,1**	30,3	**48,8**	**68,8**	*18,8*	*2,1*	35,6	*0,7*	*4,3*	*1,1*	*8,6*	**57,0**	**44,9**
USPTO high-tech patent applications[g)]	12,4	**41,6**	**22,7**	14,0	**16,4**	**18,6**	*8,1*	*0,4*	**15,1**	*0,3*	*0,3*	*0,2*	*0,5*	**91,9**	**80,0**
EPO patent applications[g)]	161,1	**337,8**	**211,0**	145,3	**309,9**	**242,7**	174,2	*7,7*	133,5	*2,4*	*19,0*	*6,1*	*40,7*	169,8	147,7
USPTO patent applications[g)]	80,1	**156,1**	**106,0**	76,5	**147,4**	**98,5**	82,6	*3,4*	77,2	*1,4*	*7,3*	*0,7*	*13,1*	**322,5**	**265,2**

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

g) Patent applications (number per one million inhabitants)

Commentary:

(1) In the area of knowledge creation Finland reports all 6 indicators to be higher by more than 20 % than the EU average; Denmark, Germany and the Netherlands has 5 such indicators, USA and Japan 4 indicators. Moreover, Finland (with the exception of all USPTO patent applications and USPTO high-tech patent applications) reaches with other four indicators the highest values of all the monitored countries.

(2) France reports only one above average indicator, the public R&D expenditures. Other indicators move in the zone of EU-15 plus minus 20 %.

(3) In all indicators the Czech Republic and Slovakia lag behind the EU average by more than 20 %; similar situation is in Greece. The most significant backwardness exists in all categories of patents. With the public R&D expenditures Hungary and Slovenia are on the level of EU-15 plus minus 20 %.

G.3.3 Transmission and application of knowledge

	EU 15	FI	DK	F	DE	NL	A	GR	UK	CZ	HU	SK	SI	US	JP
SMEs innovating in-house (manufacturing) [h]	37,4	40,9	*16,7*	33,5	**55,1**	42,5	35,5	*16,8*	*24,8*	*25,8*	-	*14,1*	*22,0*	-	-
SMEs innovating in-house (services) [h]	28,0	**34,9**	*15,4*	23,9	**43,9**	28,1	**36,4**	21,3	*18,7*	22,7	-	*10,0*	*12,7*	-	-
SMEs involved in innovation co-operation (manufacturing) [i]	9,4	**22,0**	**18,9**	**12,3**	10,9	11,1	*7,4*	*4,9*	9,6	*5,8*	-	*4,4*	8,4	-	-
SMEs involved in innovation co-operation (services) [i]	7,1	**18,3**	**12,7**	*5,4*	8,4	8,5	**10,1**	**12,4**	7,6	*5,2*	-	*1,6*	*4,4*	-	-
Innovation expenditures (manufacturing) [j]	3,45	3,91	*0,95*	3,08	**4,71**	3,07	2,83	*2,22*	2,96	*1,5*	-	**8,8**	**4,2**	-	-
Innovation expenditures (services) [j]	1,83	0,96	*0,36*	1,57	1,64	*0,79*	*0,92*	1,6	*1,39*	*0,7*	-	**7,5**	**2,6**	-	-

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

h) SMEs – small and medium-sized enterprises.
i) Shares of SMEs of a respective category in the overall number of SMEs in manufacturing (or services) (in %).
j) Innovation expenditures in % of all turnover in manufacturing, or services respectively.

Commentary:

(1) All data come from the third survey on innovations CIS 3 (Community Innovation Survey–3), completed by the European Commission in 2003. Much data are surprising. Data probably are not absolutely objective; often the interpretation of individual indicators definitions in individual enterprises was different. Moreover, the indicators do not show the quality (level) of innovations.

(2) In the area of transmission and application of knowledge Finland and Germany report 3 indicators with values by more than 20 % higher than the EU average. Denmark, Austria, Slovakia and Slovenia report 2 such indicators.

(3) It is surprising that with other four indicators Denmark reports values by more than 20 % lower than the EU-15 average. The Netherlands being top ranked in various evaluations of competitiveness reports only average figures in the transmission and application of knowledge indicators, even below average in innovation expenditures in services.

(4) In all indicators the Czech Republic reports figures lower than the EU-15 average minus 20 %. Surprising are the above average results of Slovakia and Slovenia in innovation expenditures in manufacturing and services.

G.3.4 Innovations: finance, outputs, markets

	EU 15	FI	DK	F	DE	NL	A	GR	UK	CZ	HU	SK	SI	US	JP
High-tech venture capital investment [k]	45,4	**57,5**	*31,0*	**70,7**	-	*35,1*	**55,7**	*27,9*	*30,5*	-	*1,6*	-	-	-	-
New capital raised on stock markets (% of GDP)	0,037	**0,087**	**0,080**	0,035	0,042	0,044	*0,017*	*0,017*	**0,047**	*0,019*	*0,015*	*0,012*	-	**0,218**	-
Percentage of "new to market" product sales (manufacturing) [l]	10,5	**27,2**	**14,3**	9,5	*7,1*	-	8,4	4,4	9,5	2,7	-	-	-	-	-
Percentage of "new to market" product sales (services) [m]	7,5	**12,2**	7,5	*5,5*	*3,7*	-	*4,3*	**17,9**	-	3	-	-	-	-	-
Percentage of "new to firm" product sales (manufacturing) [n]	28,6	31,1	24,2	*17,5*	**40,3**	23,8	23,1	*18,4*	-	3,5	-	-	-	-	-
Percentage of "new to firm" product sales (services) [o]	18,8	18,8	18,4	17,1	16,4	*13,9*	12,8	**37,1**	-	4,1	-	-	-	-	-
Internet access and use [p]	0,51	**0,76**	**0,93**	0,5	**0,66**	**0,74**	**0,68**	*0,05*	0,53	*0,13*	-	-	*0,33*	**0,73**	**0,88**
ICT expenditures (% of GDP)	7,0	6,8	7,4	7,4	6,9	8,3	*6,3*	*5,1*	**8,6**	**9,5**	**8,9**	7,5	*4,7*	8,2	**9,0**
Percent of manufacturing value-added from high technology [r]	14,1	**24,9**	15,0	**18,3**	11,9	12,1	11,5	*6,3*	**18,8**	-	14,9	-	15,9	23,0	**18,7**
Increase in the number of SMEs (manufacturing)[s]	12,7	12,5	12,7	-	-	12,8	-	-	**16,0**	-	-	-	-	-	-
Increase in the number of SMEs (services) [t]	16,6	15,8	**20,4**	-	-	18,5	-	-	**20,2**	-	-	-	-	-	-

Bold letters: by more than 20 % better than the EU-15 average
Italics: by more than 20 % worse than the EU-15 average
Normal letters: in the EU-15 average zone, plus minus 20 %

k) Share in the overall venture capital investments (v %).
l) Share of the "new to market" product sales in the overall manufacturing turnover (in %).
m) the same in services (v %)
n) Share of the "new to firm" product sales in the overall manufacturing turnover (in %)
o) the same in services (v %)
p) Composite indicator: of share (%) of households connected to Internet in the overall number of households (accesses) and of share (%) of SMEs with own web page in the overall number of SMEs (use).
r) Share in the overall manufacturing value added (in %). Economic Value Added (EVA) – indicator very frequently used in abroad for measuring the performance of enterprises. EVA is defined as a difference between operations profit/loss after taxation and cost of capital.
s) Increase in the number of SMEs in manufacturing (in % of the overall number of SMEs).
t) the same in services (in % of the overall number of SMEs).

Commentary:

(1) The area of innovation finance, innovation outputs and innovations markets is measured by 11 indicators. Data for most of the indicators were obtained by the above survey of the European Commission in enterprises. Data on the venture capital investments were obtained from the interest associations of venture capital companies. Values for many of the indicators are lacking, particularly for the new EU Member States, USA and Japan.

(2) Like in the previous two areas Finland has the best results. For six out of 11 indicators Finland reaches values by more than 20 % higher than the EU-15 average. The United Kingdom outperforms this limit with 5 indicators, Denmark with 4.

(3) For all countries the values are given for the indicator of information and communication technologies (in % of GDP). Above average values are accomplished by the Czech Republic (9.5 % of GDP), followed by Japan (9 % of GDP) and Hungary (8.9 % of GDP). For the Internet assess and computer use data are absent for Hungary and Slovakia. For the share of manufacturing value-added from high technology indicator (in % of overall manufacturing value-added) data are absent for the Czech Republic and Slovakia. The highest share of manufacturing value-added from high technology is reported by Finland.

G.3.5 Comparison with the EU-15 average

	Number of measured indicators	Number of indicators better than EU-15 plus 20 %	Number of indicators in zone EU-15 plus or minus 20 %	Number of indicators worse than EU-15 minus 20 %
Finland	28	19	8	1
Denmark	28	14	11	3
France	26	5	15	6
Germany	25	11	10	4
The Netherlands	26	8	13	5
Austria	26	4	13	9
Greece	25	3	4	18
United Kingdom	25	10	11	4
Czech Republic	24	2	2	20
Hungary	15	1	4	10
Slovakia	19	2	3	14
Slovenia	20	3	3	14
USA	12	8	4	-
Japan	10	8	2	-

Commentary:

(1) This table is a certain recapitulation of information in the previous four tables G.3.1 to G.3.4. Four columns for the evaluated countries show: the overall numbers of measured indicators, numbers of indicators being better by more than 20 % than the EU-15 average, numbers of indicators in the zone of the EU-15 average plus minus 20 % and numbers of indicators being worse by more than 20 % than the EU-15 average.

(2) More than half of indicators higher than the EU-15 average plus 20 % is reported by Finland (19 out of 28), Japan (8 out of 10) and USA (8 out of 12). Half of the above average indicators is reported by Denmark (14 out of 28).

(3) Very low numbers of above average indicators are reported by all new EU Member States and Greece: the Czech Republic 2 out of 20; Hungary 1 out of 15; Slovakia 2 out of 19 and Slovenia 3 out of 20. The same applies also to indicators in the zone of the EU-15 average plus minus 20 %.

H. Implementation of the National Research and Development Policy

The National Research and Development Policy of the Czech Republic for 2004-2008 was adopted by the Government in its Resolution No.5 of January 7, 2004. Any more detailed evaluation of the implementation of individual parts of the National Research and Development Policy of the Czech Republic of CR (hereinafter referred to as "NR&DP") would be premature after less than one year of being in effect. Therefore the presented analysis limits itself only to fulfilment of tasks imposed by the above mentioned Government Resolution No.5 of January 7, 2004 and tasks imposed by several other Government resolutions immediately related to NR&DP and influencing its implementation. The more detailed continuous evaluation of the applicable NR&DP will be made in the 2006 R&D Analysis.

H.1 Government Resolution No. 5 of January 7, 2004 to NR&DP

In point II.1 the Government imposed on

the Government members and heads of other central bodies of public administration and the Chairwoman of the Academy of Sciences of CR to produce and submit in accordance with the Policy[1] *and in coordination with the Minister of Education, Youth and Sports the development concept of research and development in respective areas of their competencies by December 31, 2004.*

The Ministry of Education, Youth and Sports established a working group for coordinating the preparation of departmental R&D policies, with one representative appointed from each department. The working group members made themselves familiar with NR&DP and its tasks. The Ministry of Education, Youth and Sports representatives presented the framework draft outline of the departmental concept. Moreover, the working group members became acquainted with the tasks arising for each department from the Government Resolution No.513 of May 26, 2004 on the access of the Czech Republic to the material "Investing in Research: Action Plan for Europe" and other EU documents on research and development. Within the coordinated preparation of departmental policies the representatives of key departments commented on the proposal of elaboration of priority actions of the Action Plan for Europe in relation to the Government Resolution No.513 of May 26, 2004.

In point II.2 the Government imposed on

the Vice-Premier for research and development, human rights and human resources and Chairman of the Research and Development Council, in cooperation with the Vice-Premier and Minister of Finance and other Government members to project the Policy and related departmental concepts into the draft state budget of CR for individual years, with taking notice of the economic possibilities in such way to create favourable conditions for fulfilment of tasks resulting from the Barcelona targets and Lisbon strategy.

The Research and Development Council submitted the proposal of the 2005 state budget R&D expenditures along with the 2006 and 2007 outlooks on June 15, 2004. The Government approved the submitted proposal as a part of the Bill on 2005 State Budget of the Czech Republic and as a part of the Medium-term Outlook for 2006 and 2007 by its resolution of September 2004. In line with the proposal the R&D expenditures will grow from CZK 14.7 billion (0.54 % of GDP) in 2004 to CZK 16.5 billion (0.57 % of GDP) in 2005, CZK 18.2 billion (0.59 % of GDP) in 2006 and CZK 22.4 billion (0.68 % of GDP) in 2007.

1 In the Government resolution the term "Policy" was introduced as an abbreviation for the "National Research and Development Policy of the Czech Republic for 2004–2008".

In point II.3.a the Government imposed on

the Minister of Education, Youth and Sports to submit to the Government the evaluation of the indirect tools of R&D support by December 31, 2004.

The Ministry of Education, Youth and Sports assigned the drawing up the study on the use of indirect support tools in the EU Member States. The study was drawn up and delivered to the Ministry. Upon this study the Ministry compiled the material to be submitting to the Government.

In point II.4 the Government imposed on

the Minister of Education, Youth and Sports and the Vice-Premier for research and development, human rights and human resources, in cooperation with competent ministers to submit to the Government the proposal of access of the Czech Republic to the Action Plan for Europe and other documents of the European Union on research and development by March 31, 2004.

The document of the European Commission "Investing into Research: Action Plan for Europe" contains several dozens of actions for various areas of economy and society, which should contribute to the fulfilment of the 2000 Lisbon strategy targets. According to this strategy Europe is to change to a knowledge-based dynamic economy with the highest world competitiveness.

In the material submitted to the Government the Ministry of Education, Youth and Sports in cooperation with the Research and Development Council characterised the individual actions, reported the activities already being realised by the Czech Republic and proposed other concrete activities with related responsibilities.

By its Resolution No.513 of May 26, 2004 the Government approved the access of CR to the document "Investing into Research: Action Plan for Europe" and other EU documents on research and development.

In point II. 1 the Government imposed on

the Government members and heads of other central bodies of the public administration to pursue the Access[2] on national level.

In point II. 2 the Government imposed on

the Minister of Education, Youth and Sports and Vice-Premier for research and development, human rights and human resources, in cooperation with other Government members and heads of other central bodies of the public administration, to select and develop the priority actions in the Access and submit to the Government proposal for their solution by December 31, 2004.

The Ministry of Education, Youth and Sports and the Research and Development Council, together with other bodies, are preparing a limited selection of priority actions, which would provide the increase in the benefit of research and development to the economic development and growth in the Czech economy competitiveness. The deadline for submitting to the Government will be kept.

In point II. 5 the Government imposed on

the Vice-premier for research and development, human rights and human resources and Chairman of the Research and Development Council to work out the complex draft evaluation of R&D results and efficiency and submit it to the Government by June 30, 2004.

Basically the same task the Government imposed by its Resolution No.1167 of November 19, 2003 to the 2003 Analysis of the existing state of research and development in the Czech Republic and a comparison with the situation abroad. Surviving drawbacks in the continuous, but particularly in the final evaluation of research projects, research and development programmes and research plans, and drawbacks in evaluation of research organisations and institutions make impossible to distinguish the quality and efficiency and project the evaluation results into the amount of granted support. The drawbacks in evaluation prevent the motivation of above standard organisations, teams and individuals. The evaluation issue is dealt with in a separate part of NR&DP, Chapter II.1, paragraphs [19] to [30].

The Research and Development Council in cooperation with its expert commissions for individual scientific disciplines and advisory bodies submitted to the Government the proposal of evaluation of research and development and its results. The Government by its Resolution No.644 of 23 June, 2004 approved the evaluation of research and development and its results and imposed

2 In the Government resolution the term "Access" was introduced as an abbreviation for the "access of the Czech Republic to the document ´Investing into Research: Action Plan for Europe´ and to other EU documents on research and development ".

numerous tasks on the Government members and heads of other central bodies, from the budgetary chapters of which the research and development is supported (including the Chairwoman of the Academy of Sciences of CR and Chairman of the Grant Agency of CR). In particular, it imposed on them to ensure within their competencies the approved system of evaluation, ensure the supply of data into the R&D information system, evaluate the results of completed research and development programmes and submit the outcome to the Research and Development Council by November 30, 2004 and to submit by September 30 of the year following the completion of the research and development programme the result of its evaluation to the Research and Development Council for opinion. It imposed on the Vice-Premier for research and development, human rights and human resources and Chairman of the Research and Development Council to carry out evaluation of all results delivered by September 6, 2004 into the R&D information system and to project the result of evaluation into the proposal of the amount of R&D expenditures within respective budgetary chapters for 2006, with repeating this procedure also for following years.

Thus the dependency of support upon the accomplished results should be introduced into the system of research and development support. For the precise wording of imposed tasks see Appendix H-1.

The above mentioned Government Resolution No. 644 of June 23, 2004 imposed on the Vice--Premier for research and development, human rights and human resources also other concrete tasks related to the research and development evaluation, as follows:

in point II. c

to submit to the Government the summary evaluation of results of research and development programmes by March 31, 2005 and project this outcome into the proposal of the R&D expenditures of respective budgetary chapters for 2006 being submitted to the Government

in point II. d

to submit to the Government the proposal for simplification and unification of the paperwork for granting the support and evaluating the projects, research plans and other research and development activities and their results by June 30, 2005.

The realisation of this proposal should moderate the numerous justified complaints about excessive paperwork and lack of unity in the system of research and development supports in the Czech Republic. The proposal preparation has already started and all providers submitted complete grounds which will be thoroughly analysed. Upon results of this analysis a proposal will be submitted to the Government in a set deadline for simplification and unification of the research and development paperwork.

in point III

to develop in cooperation with the Minister of Education, Youth and Sports the methodology of evaluation of research and development and its results by October 31, 2004 and send it to the members of the Government and heads of other central bodies, from the budgetary chapters of which the research and development is supported, and to the Chairwoman of the Academy of Sciences of CR and Chairman of the Grant Agency of CR.

The methodology should facilitate the departments in evaluation of research and development and its results, unify procedures and prevent different interpretation of certain more general principles of the research and development evaluation system approved by the Government. The methodology was developed and sent in line with the imposed task.

The implementation of NR&DP is assisted also by tasks imposed by other resolutions of the Government. The following part contains information on fulfilment of tasks from related Government resolutions.

H.2 Bill on public research institutions

Several years of experiences have confirmed, repeatedly, that the legal form of contributory and budgetary organisations and organisational bodies of the state is not suitable for organisations concerned with research, the results of which are not intended only for the appropriate administrator of the budgetary chapter, but have a broader application. These organisations need another way of management, financing and evaluation.

Upon the grounds of the task imposed in connection with the previous National Research and Development Policy, which the Government approved by its Resolution No.16 of January 5, 2000, the draft of broad intention of the act was prepared. The Government approved the broad intention of the act on public research organisations and on amendments to certain related acts by its Resolution No.331 of April 7, 2003 and

in point II the Government imposed on

the Vice-Premier for research and development, human rights and human resources to work out and submit to the Government, in cooperation with the Minister of Education, Youth and Sports and the Chairwoman of the Academy of Sciences of CR, the bill on public research organisations and on amendment to certain related acts by October 31, 2003, with incorporated amendments of the Chairman of the Government Legislative Council.

It turned out that the preparation of the "paragraphed" version of the act will be more complicated than expected. Significant problems appeared particularly in the part dealing with the public research organisations management.

The bill on public research organisations and bill on amendments to certain acts in relation with adoption of the act on public research institutions was submitted by the Chairman of the National Research and Development Council, Minister of Education, Youth and Sports and Chairwoman of the Academy of Sciences of CR to the Government on May 24, 2004. After being discussed within commissions it was submitted to the Government Legislative Council for discussion on September 2, 2004. The discussions were stopped with explanation that the Government Legislative Council reporters would discuss the draft amendments and changes of submitted bills with their submitters and then the interrupted discussions of the Government Legislative Council would resume. The modified bill was discussed by the Government Legislative Council on November 11, 2004.

The act on public research institutions will provide the transformation of institutes of the Academy of Sciences of CR and departmental research institutions according to the European standards with the aim to facilitate their effective cooperation with universities and foreign institutions. Moreover, this act will make possible to establish new institutions because after 1992 the structure of research institutions was conserved by applicable regulations, with few exceptions, and as opposed to the advanced countries no new institutions were established, merged, split, etc.

H.3 National Research Programmes

National Research Programmes are one of the main tools of the National Research and Development Policy implementation. The first National Research Programme was developed in relation to the first National Research and Development Policy of CR, which was approved by the Government Resolution No.16 of January 5, 2000. Hundreds of research workers and representatives of the user public took part in preparation of the draft programme. The method of technology foresight was applied at its preparation, which was coordinated by the Technology Centre of the Academy of Sciences of CR. After certain delays caused by disputes about the factual target of the programme and ways of its administration and funding the National Research Programme I was approved by the Government Resolution No.417 of April 28, 2003 for 2004–2009. Being fully aware of certain drawbacks of the approved programme the Government imposed that between 2006 and 2009 no new projects will be started. According to this resolution a new National Research Programme will start in 2006 which will lack the drawbacks of the existing programme.

In point II.1 the Government imposed on

the Minister of Education, Youth and Sports to prepare, in cooperation with the Vice-Premier for research and development, human rights and human resources and Chairman of the National Research and Development Council, and submit to the Government by February 28, 2005 the draft National Research Programme II with its term of commencement on January 1, 2006; works on its preparation will start immediately and in such way to be financed under the budgetary chapter of the Ministry of Education, Youth and Sports.

The preparation of the National Research Programme II (NRP II) is coordinated by special divisions of the Ministry of Education, Youth and Sports in co-operation with the Research and Development Council and other central bodies of public administration. An informal working group was established that discusses the main issues of the draft NRP II preparation. Following structures took part and are taking part in preparation of papers being further processed by the Ministry of Education, Youth and Sports:

a) *Experts panels* preparing the thematic contents of individual parts of NRP II. Processing of results of these panels by the technology foresight method is provided for the Ministry of Education, Youth and Sports by the Technology Centre of the Academy of Sciences of CR in cooperation with the Centre for Economic and Social Strategies CESES, Charles University in Prague.
b) *NRP II Council* composed of representatives of interested departments and institutions; it evaluates each stage of preparation and gives recommendations for further advancement.
c) *Working group for coordination of NRP I* prepares grounds for the system of programme management and administration – proposals for printed forms, evaluation procedures and contracts on provision of grants, etc. It is expected that the grounds will be used during the NRP I implementation and in departmental programmes.

User and application sphere takes part in the programme preparation in three ways:

a) by participation of representatives of its associations in the NRP II Council, e.g. the representative of Confederation of Industry and Transport of CR;
b) by marked representation in experts panels for individual thematic directions;
c) by participation in an extensive survey carried out by the Technology Centre of ASCR in more than two hundred industrial enterprises, in which the enterprises were asked about their interest in the programme or financial co-participation in solution of projects included in the programme.

Significant change in comparison with the running NRP I will be the programme financing from two budgetary chapters – the Ministry of Education, Youth and Sports and Ministry of Industry (instead of eight in case NRP I). It is expected that this change will remove the existing methodological and administrative differences in the administration and management of individual component programmes of NRP I. With NRP II also new forms of R&D support in accordance with new EU legislation will be employed. Also changes in the draft projects evaluation are taken into account. Furthermore, certain bonuses for projects will be introduced contributing also to the fulfilment of other targets of the National Research and Development Policy of the Czech Republic.

H.4 Innovation Policy

If the research and development policy is not to be endangered by certain aspects of creating the "research for research's sake" without an adequate scope of concrete outputs, it must be closely connected with the innovation policy. The research and development is the main source of ideas for innovation of products, technologies and services. So far, the Czech Republic has no official governmentally approved innovation policy. It is evidently one of the main causes of the inadequate application of research and development results, and maybe also the cause of absence of such results, which could be quickly and effectively applied in new innovated products, technologies and services.

After certain delays caused by competence disputes the section of the Vice-Premier for research and development, human rights and human resources has finally prepared the draft National Innovation Strategy. The Government approved this strategy by its Resolution No.270 of March 24, 2004 and incorporated the area of innovations into the highest state priorities. Moreover, by the same resolution

in point III the Government imposed on

1. *the Vice-Premier for research and development, human rights and human resources, the Minister of Industry and Trade and the Minister of Education, Youth and Sports to work out in cooperation with other Government members and submit to the Government the draft National Innovation Policy for 2005 – 2008 by November 30, 2004.*
2. *the Vice-Premier for research and development, human rights and human resources, in cooperation with the Vice-Premier and Minister of Finance, to submit to the Government the proposal of necessary legislative changes for the area of innovations, or proposal of the broad intention of the act on innovations by March 31, 2005.*

In connection with this resolution the working and management structures were established for preparation of the draft innovation policy, with an adequate involvement of the private sphere. The experts who took part in the preparation of the National Research and Development Policy are taking part in this preparation process as well. During preparation of the draft innovation policy the rich information sources of EU on innovations will be used, which are collected and distributed via the TrendChart portal. Also the more intensive involvement of the Czech Republic experts in workshops, discussion forums and analytical studies organised and arranged by the European Commission is expected.

An important factor intervening into the preparation was the Government policy statement of August 2004, when this issue was given more attention to than up to now. The draft National Innovation Policy in the new concept will be submitted to the Government in the first quarter of 2005.

It may be summarised that fulfilment of NR&DP is progressing well. The works on the new system of evaluation of research and development and its results are finished in principle. The evaluation should contribute to gradual improvement in the efficiency and effectiveness of the Czech research. Also the preparation of the governmental bill on public research institutions approaches the advance stage. Also this act is expected to contribute to the increase in the research efficiency. The selection of priorities of the action plan implementing the Lisbon strategy will strengthen the participation of CR in creation and development of the European Research Area. The preparation of the innovation policy and provision of its links with the research and development policy increases the benefits of research and development to the economy and society of the Czech Republic. Detailed evaluation of NR&DP will be made within the analysis of research and development in 2006.

GOVERNMENT OF THE CZECH REPUBLIC RESOLUTION OF THE GOVERNMENT OF THE CZECH REPUBLIC

No. 644 of June 23, 2004

to the evaluation of research and development and its results

The Government

I. approves the evaluation of research and development and its results as referred to in Part III.2 of the material Ref. No. 841/04;

II. imposes on

1. the Government members and heads of other central bodies, from the budgetary chapters of which the research and development is supported, the Chairwoman of the Academy of Sciences of CR and Chairman of the Grant Agency of CR to

a) ensure within their competences the evaluation of research and development and its results in accordance with point I of this Resolution,

b) provide the supply of data into the research and development information system in accordance with point I of this Resolution,

c) evaluate results of research and development programmes completed between 2000 and 2003 and their efficiency, and of programmes, for which the providers suggest to prolong the term of their solution, in accordance with point I of this Resolution, and submit the result to the Vice-Premier for research and development, human rights and human resources and Chairman of the Research and Development Council by November 30, 2004,

d) evaluate by September 30 of the year following the completion of the research and development programme its results in accordance with point I of this Resolution and submit the result of this evaluation to the Vice-Premier for research and development, human rights and human resources and Chairman of the Research and Development Council for opinion,

e) introduce during the evaluation of results of completed projects, research plans and other research and development activities the method of evaluation similar to the method of evaluation of their drafts in accordance with point I of this Resolution,

f) observe during the evaluation of research and development and its results the basic evaluating principles in accordance with point I of this Resolution,

2. the Vice-Premier for research and development, human rights and human resources and Chairman of the Research and Development Council

a) to conduct in accordance with Section 35(2)(f) of Act No. 130/2002 Coll. the evaluation of all results delivered by September 6, 2004 into the research and development information system in accordance with point I of this Resolution, accompanied with comparison of resources spent on their accomplishment, and project the result into the proposal of the amount of research and development expenditures of respective budgetary chapters for 2006 submitted to the Government,

b) to carry out the task in accordance with point II/2 a) of this Resolution also in following years,

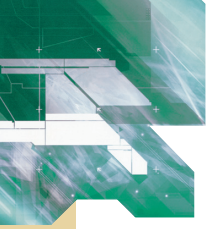
c) to submit to the Government the summary evaluation of results of research and development programmes in accordance with point II/1 c) of this resolution by March 21, 2005 and project the result into the proposal of the amount of research and development expenditures of respective budgetary chapters for 2006 submitted to the Government,

d) to submit to the Government the proposal for simplification and unification of paperwork for granting the support and evaluating the projects, research plans and other research and development activities and their results by June 30, 2005,

3. the Vice-Premier for research and development, human rights and human resources and Chairman of the Research and Development Council and the Minister of Education, Youth and Sports to work out the methodology of evaluation of research and development and its results by October 31, 2004 and send it to the Government members and heads of other central bodies, from the budgetary chapters of which the research and development is supported, the Chairwoman of the Academy of Sciences of the Czech Republic and the Chairman of the Grant Agency of the Czech Republic.

Implemented by:
the Government members and heads of other central bodies of public administration,
the Chairwoman of the Academy of Sciences of the Czech Republic,
the Chairman of the Grant Agency of the Czech Republic

the Premier
PhDr. Vladimír Š p i d l a , m. p.



I. Evaluation of participation of the Czech Republic in the 6th EU Framework Programme for Research and Development

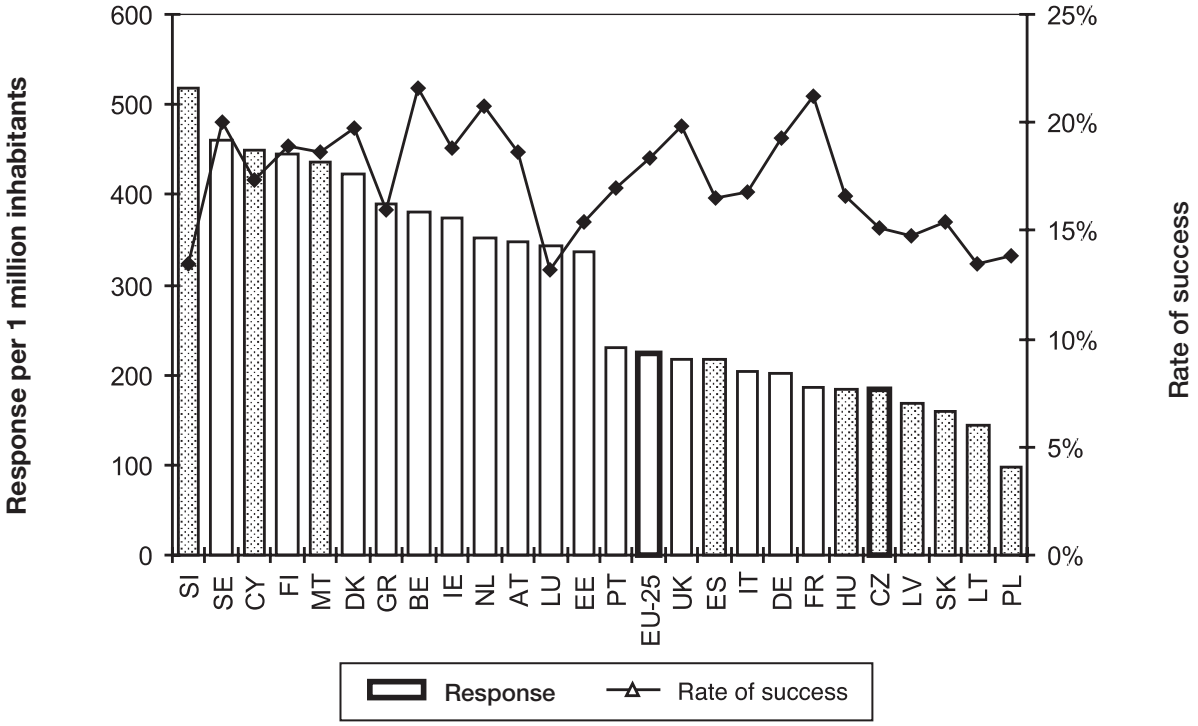
Since commencement of the programme in December 2002 to April 2004 the European Commission obtained more than 14 000 draft projects, on the preparation of which over 137 000 teams from all over the world took part; among them 2 369 participations of teams from the Czech Republic taking part in preparation of 1 727 draft projects. In this opening phase of the 6th EU Framework Programme for Research and Development (6FP), when no results of individual projects are known so far, it is possible to evaluate the participation of the Czech Republic in the 6FP through statistical data making possible the comparison with other states. Considering the rich structure of 6FP it is necessary, however, to choose reasonable aggregate data available for most of the states. Basic information about 6FP are referred to in Appendix I-1. Data on participation of respective states mentioned below come from materials of SP1 programme committee for Concentrating and Integrating Community Research. The mentioned data were released to the Member States in May 2004.

In this chapter we present the summaries on the number of the EU-25 states participations in response to calls for submission of projects, whose results were known by April 15, 2004. For comparison purposes the numbers of participations of respective states are converted to a unit population of 1 million. Data on participations are broken down as follows:

- Summary participation for the whole 6FP in draft projects submitted to the European Commission (the response to 64 calls for submission of projects delivered by the European Commission in total since the beginning of 6FP);
- Summary participation for the whole 6FP in successful projects (i.e. projects the solution of which will be supported by the European Commission through the contribution from 6FP budget);
- Comparison of the Czech Republic's participation with the average EU-25 participation in individual 6FP priorities (thematic or sectional programmes)
- For each of seven thematic priorities the summary participation is mentioned both in draft projects and successful projects.

By summary participation we mean the overall number of participations of a given state either in draft projects or successful projects. When interpreting these aggregate data it is necessary to take into account that they distinguish neither between types of projects according to their orientation (whether it is a research, demonstration, supportive or other project) nor the size of their budgets moving from several tens of thousands to several tens of millions of euro. Even though the graphs imply largely the ranking of EU-25 states in responses or successful 6FP projects it must be kept in view that information about the participation of a particular state team in the project gives no information about the size and importance of the national team for the project's solution.

I.1 Response of EU-25 Member States to call for participation in 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

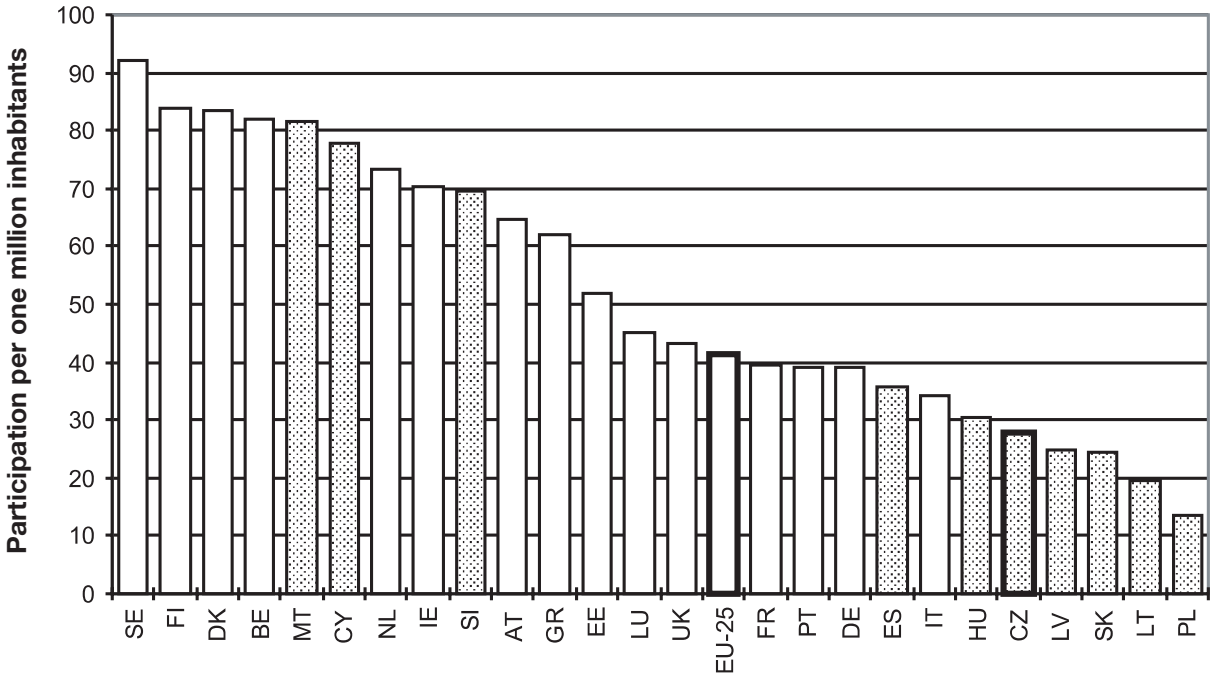
Commentary:

(1) The column graph I.1 displays the responses of EU-25 states to all 6FP calls, which were evaluated by April 15, 2004. The response means the number of participations of a particular state teams in draft projects when converted to a unit population of 1 million inhabitants. States of the original EU-15 are indicated by columns without filling, new member states by grey columns. The scale is on the left vertical axe.

(2) The average response in EU-25 reached 223.9 participations per one million inhabitants. The largest response came from Slovenia, smallest from Poland. The response of the Czech Republic reached the value of 183 giving it the 21st place among the EU-25 states, or 6th place among the new Member States. The response of the Czech Republic was roughly half of the value in comparison with the Western European states of a comparable size (Sweden, Greece, Belgium, the Netherlands and Austria).

(3) The curve depicts the participation success of respective states (i.e. ratio of number of participants in projects, which successfully passed through the evaluation and could compete for the European Commission contribution to the number of all participants having taken part in preparation of all projects entering the evaluation process, expressed in %). The average participation success in EU-25 amounted to 18.4 % (this level is marked by a dashed line in the graph). It is apparent from the graph that none of the new Member States attains even an average rate of success. The highest success was accomplished by Belgium (21.6 %), closely followed by France (21.2 %). Slovenia reported the lowest rate of participation success of all (13.4 %). The successfulness of the Czech Republic reached 15.1% (19th place among EU-25, or 5th place among the new Member States respectively).

I.2 Participations of EU-25 states in all 6FP calls



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

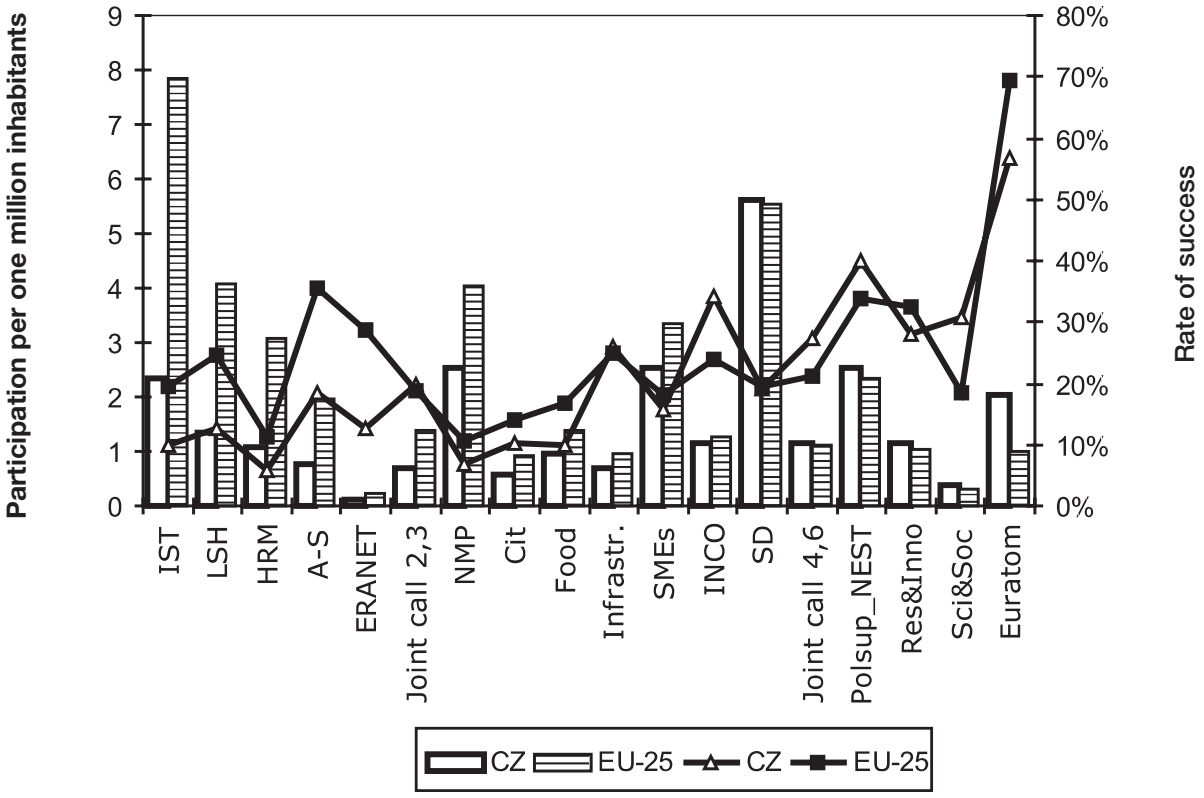
Commentary:

(1) The participation means the number of participations of a particular state teams in successful projects (i.e. projects, which successfully passed through the evaluation by April 15, 2004 and could compete for the European Commission contribution) converted to a unit population of 1 million inhabitants. States of the original EU-15 are indicated by columns without filling, new member states by grey columns.

(2) The average participation in EU-25 reached 41.4 participations in successful projects per one million inhabitants. The largest participation has Sweden constantly investing the highest percent of GDP into research and development of all EU-25 states. The Polish participation is the lowest of all.

(3) Out of the new EU Member States the EU-25 average participation was surpassed by small states like Malta, Cyprus, Slovenia, and Estonia. By its participation (27.7) the Czech Republic is classified on the 21st place among the EU-25 states or on the 6th place among the new Member States respectively. The participation of the Czech Republic attained only 39 % of the participation of Slovenia.

I.3 Participation of the Czech Republic and average participation of EU-25 Member States in individual 6FP priorities



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

Meaning of abbreviations:

IST	– 2nd thematic priority of 6FP: Information society technologies;
LSH	– 1st thematic priority of 6FP: Life sciences, genomics and biotechnology for health;
HRM	– Human resources and mobility;
A-S	– 4th thematic priority: Aeronautics and space;
ERANET	– Coordination of national research activities;
Joint call 2, 3	– Joint call of 2nd and 3rd thematic priorities;
NMP	– 3rd thematic priority: Nanotechnologies, nanosciences, intelligent multifunctional materials, and new production processes and devices;
Cit	– 7th thematic priority of 6FP: Citizens and governance in a knowledge based society;
Food	– 5th thematic priority of 6FP: Food quality and safety;
Infrastr.	– Scientific infrastructures;
SMEs	– Research activities of small and medium-sized enterprises;
INCO	– Research co-operation with third countries;
SD	– 6th thematic priority of 6FP: Sustainable development – global changes and ecosystems;
Joint call 4, 6	– Joint call of 4th and 6th thematic priorities
Polsup	– NEST-Research to support policies and New and emerging science and technology;
Res&Inno	– Research and innovation;
Sci&Soc	– Science and society;
Euratom	– Research on peaceful use of nuclear energy

Commentary:

(1) The column graph I.3 compares the participation of the Czech Republic (columns without filling) with the EU-25 average participation (columns with grey filling) in individual priorities of 6FP. Like in the previous two graphs the "participation" means the number of participants in successful projects converted to a population of one million. The curves show the participation success of the Czech Republic (line with triangles) and EU-25 (line with squares). The priorities of 6FP are arranged in the graph from left to right according to the growing share of "the Czech Republic's participation/EU-25 participation".

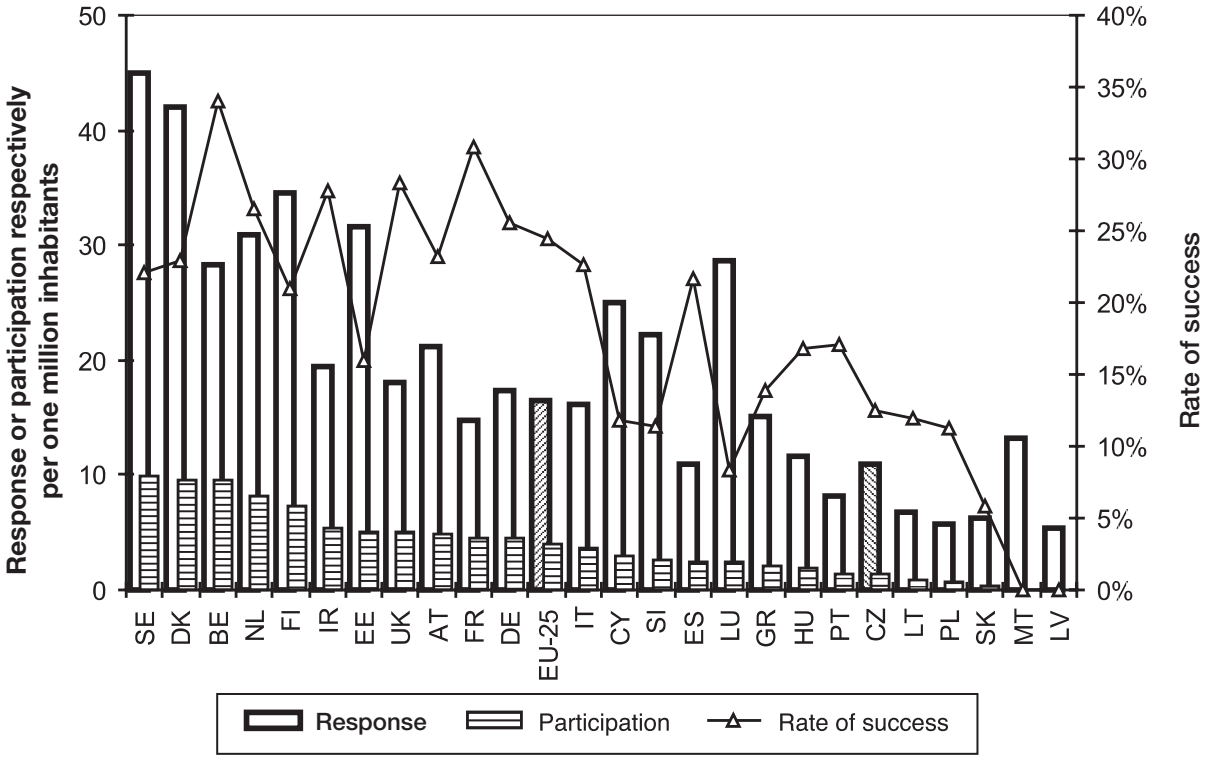
(2) In the priorities IST, LSH, HRM, A-S, ERANET, Joint call 2, 3 NMP, Cit the participation of the Czech Republic did not reach even 2/3 of the average value of the EU-25 participation. The Czech participation did not reach the average participation of the EU-25 teams also in priorities Food, Infrastr., SMES and INCO. The participation of small and medium-sized enterprises of the Czech Republic (MSP – SMEs) reached 75 % of the EU-25 average.

(3) On the other hand in priorities SD, Joint call 4, 6, Polsup – NEST, Res&Inno, Sci&Soc, Euratom the participation of the Czech Republic exceeded the average EU-25 participation. In case of Euratom the Czech participation is double the EU-25 average.

(4) The curves show great differences in successfulness between individual priorities. The lowest rate of success both in EU-25 and the Czech Republic is in priorities NMP (EU-25: 10.5 %, Czech Republic: 7 %) and HRM (EU-25: 11.3 %, Czech Republic: 6 %). The greatest rate of success is in Euratom priority (EU-25: 69.5 %, Czech Republic: 56.8 %).

(5) It is evident that the curve of successfulness of the Czech Republic follows to a certain extent the curve of the EU-25 successfulness, but with priorities IST, LSH, A–S drawing an essential part of 6FP budget the rate of success of the Czech participants is approximately half when compared with the EU-25 rate of success. The low rate of success is then one of the factors resulting in a very low participation of teams in these important priorities.

I.4 Response and participation of the EU-25 countries in the 1st thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

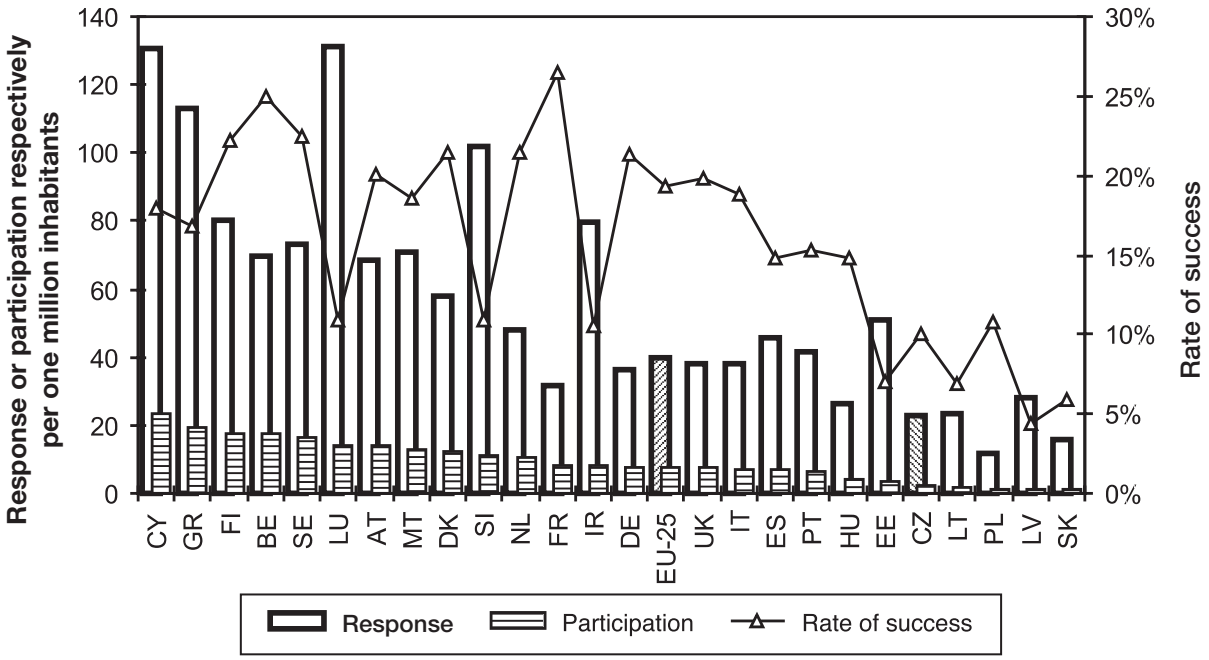
Commentary:

(1) The column graph I.4 depicts the response (columns without filling) and intensity of participation (columns with light grey filling) of the EU-25 states in the 1st thematic priority of 6FP "Life sciences, genomics and biotechnology for health". The columns of EU-25 and Czech Republic response rates are dark grey. The curve displays the participation success of individual states. The states are arranged according to their descending participation.

(2) The highest participation has Sweden (9.9), the lowest Malta and Latvia, which do not take part in any project.

(3) The Czech Republic admittedly attained the second highest rate of success among the new Member States (12.5 %) after Hungary (16.6 %), but in the end as a result of a smaller response (10.9 – corresponding to the 20th place among EU-25) its participation is 1.4 ranking it to the 19th place among EU-25. While each of the Western European states of a comparable size (Sweden, Belgium, the Netherlands, and Austria) will participate in the solution of at least 40 projects, Czech teams will work on 14 projects.

I.5 Response and participation of the EU-25 countries in the 2nd thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

Commentary:

(1) The column graph I.5 depicts the response (columns without filling) and participation rates (columns with light grey filling) of the EU-25 states in the 2nd thematic priority of 6FP "Information Society technologies". The response rates of EU-25 and Czech Republic are dark grey. The curve displays the participation success of individual states. The states are arranged according to their descending participation.

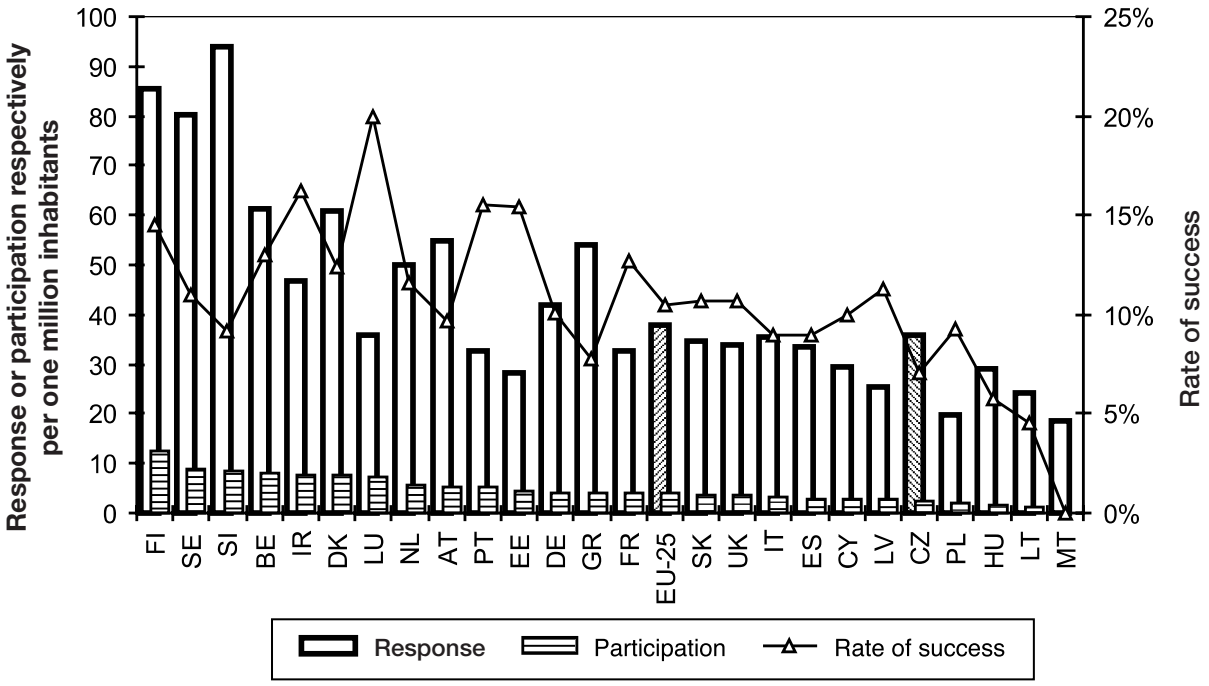
(2) The greatest response came from small states (Luxembourg, Cyprus, Slovenia and Ireland), with a medium-sized Greece impacted in between.

(3) But with the exception of Cyprus and Malta the rate of success of small states (Luxembourg, Slovenia, Ireland, Greece, Latvia and Lithuania) moved around 10 % (that is approximately half the average successfulness of EU-25).

(4) The highest participation in the projects solution has Cyprus (23.5), followed by Greece (19), on the other end there are Slovenia (0.9) and Latvia (1.2) with the lowest participation rates.

(5) The Czech response was 23.1 being the third lowest value among the EU-25 states with successfulness of only 10.1 %. Therefore the participation of the Czech Republic in IST projects does not reach even 1/3 of the EU-25 participation and its value 2.3 corresponds with the 21st place among the EU-25 states. Nevertheless, only in this thematic priority the Czech team will coordinate one of the integrated projects.

I.6 Response and participation of the EU-25 countries in the 3rd thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

Commentary:

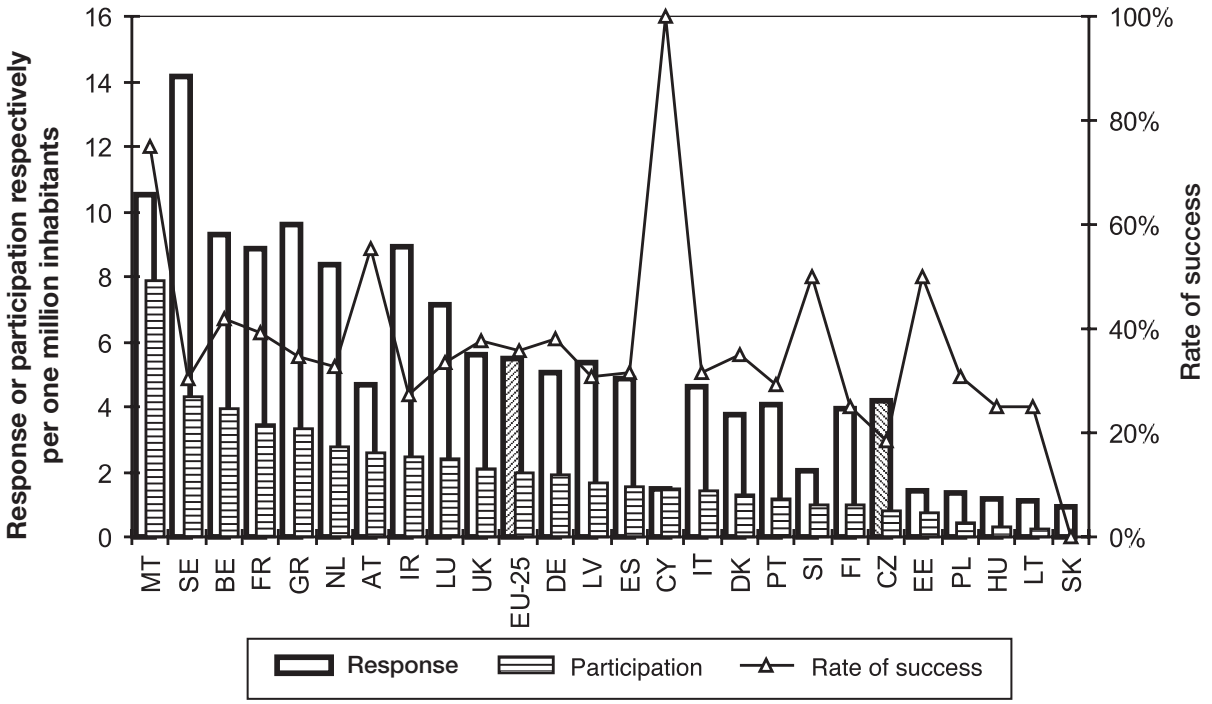
(1) The column graph I.6 depicts the response (columns without filling) and participation rates (columns with light grey filling) of the EU-25 states in the 3rd thematic priority of 6FP "Nanotechnologies, nanosciences, intelligent multifunctional materials and new production processes and devices". The response rates of EU-25 and Czech Republic are dark grey. The curve displays the participation success of individual states. The states are arranged according to their descending participation.

(2) While Slovenia (94) and Finland (85) had the highest response rate, the lowest response rates were reported by Poland (19.7) and Malta (18.4).

(3) The rate of success in this priority was only 10.5 % (EU-25 average) being the lowest value among all thematic priorities. The highest rates of success report Luxembourg (20 %) and Portugal (15.5 %).

(4) The Czech response was 36 and this is not far away from 38 being the EU-25 average. The Czech Republic had the fourth lowest rate of success (7 %) and therefore the final participation of the Czech Republic in 6FP projects is 2.5 corresponding to the 21st place among EU-25 states.

I.7 Response and participation of the EU-25 countries in the 4th thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

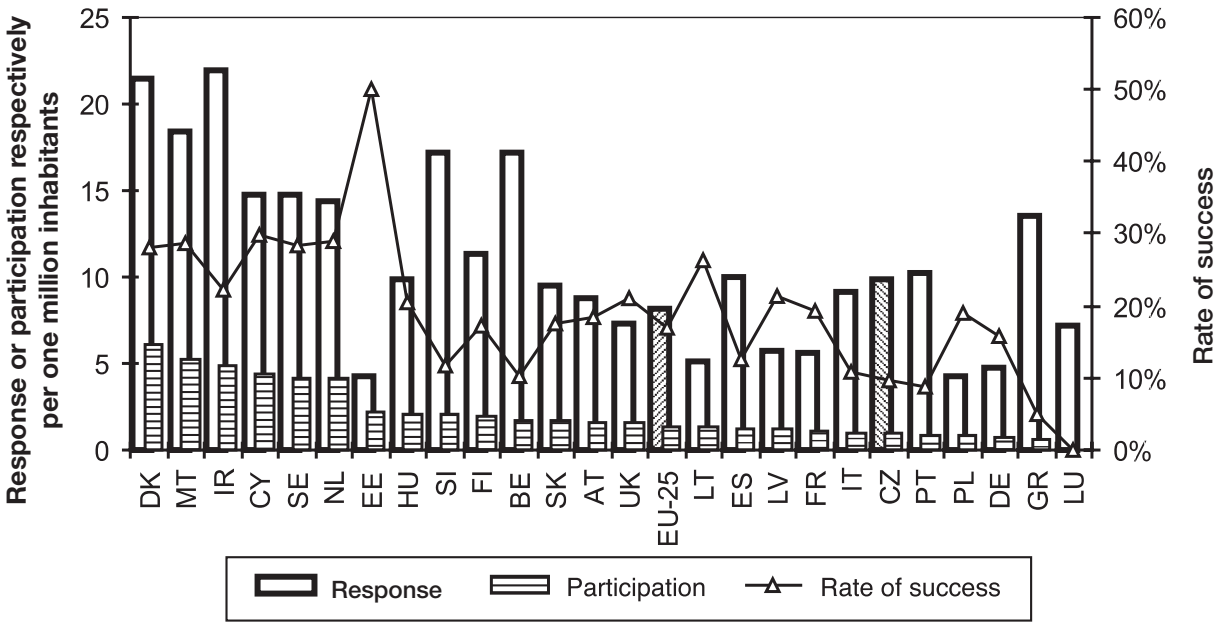
Commentary:

(1) The column graph I.7 depicts the response (columns without filling) and participation rates (columns with light grey filling) of the EU-25 states in the 4th thematic priority of 6FP "Aeronautics and space". The response rates of EU-25 and Czech Republic are dark grey. The curve displays the participation success of individual states. The states are arranged according to their descending participation.

(2) The highest participation rate in projects of this priority is reported by Malta, which would indicate its strategic position in the European aeronautical and space research. On this place it is necessary to remind that statistics based on "numbers of projects or participants" do not tell anything on the relevance of projects, which would be better indicated by the financial budget of that particular participant. But such information are not available.

(3) The Czech Republic had the second highest response of the new Member States (4.2) after Latvia (5.1), but as a result of low successfulness of draft projects (18.6 %, while the average rate of success in EU-25 was nearly the double, 35.6 %) it attained 20th place when talking about participation in projects solution.

I.8 Response and participation of the EU-25 countries in the 5th thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

Commentary

(1) The column graph I.8 depicts the response (columns without filling) and participation rates (columns with light grey filling) of the EU-25 states in the 5th thematic priority of 6FP "Food quality and safety". The response rates of EU-25 and Czech Republic are dark grey. The curve displays the participation success of individual states. The states are arranged according to their descending participation.

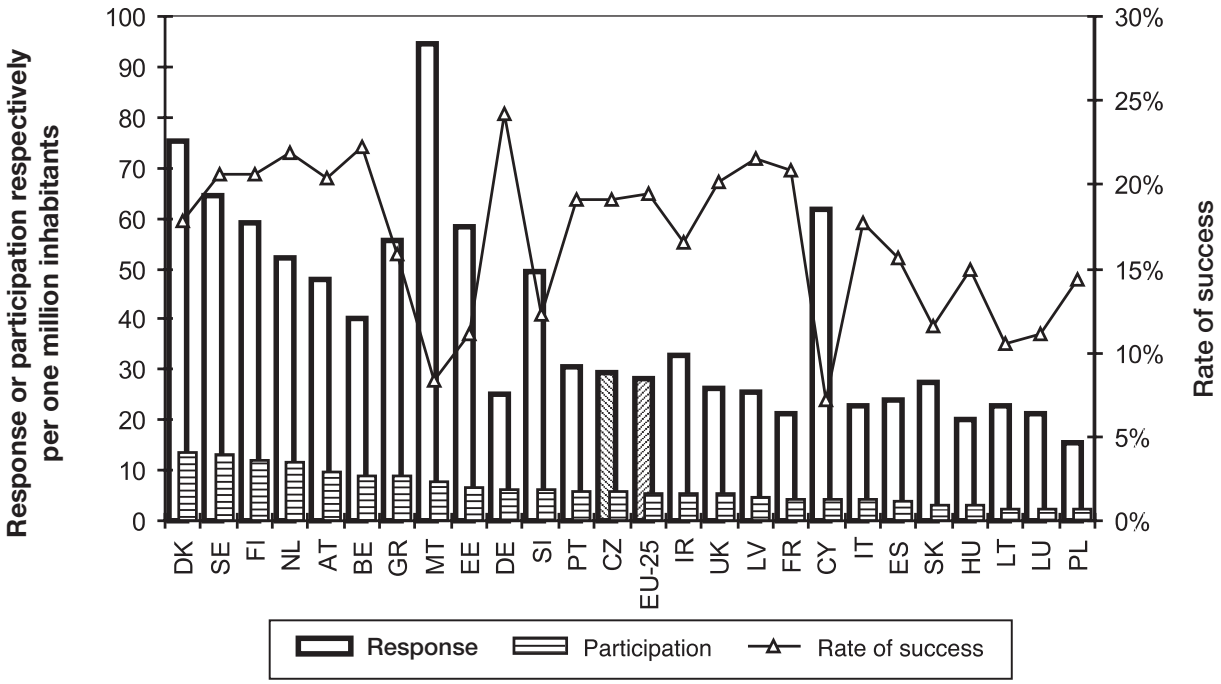
(2) The highest response came from Ireland (22) and Denmark (21.5), which has the highest food production in Europe per head. The response of three largest states, i.e. Germany (4.8), France (5.6) and the United Kingdom (7.3) was largely under the average response rate of EU-25 (8.2).

(3) Small and medium-sized states often accomplished in this priority markedly higher success than large states: Estonia (50%), Cyprus (30%), Malta (29%), Denmark (28 %), Sweden (28%), and Lithuania (26.3%).

(4) This priority does not mean the smallest participation for the new Member States (as in other thematic priorities), but for Greece, which had an above average response, but very low rate of success, and Luxembourg with zero success. Very small response and below average success has Germany.

(5) The Czech Republic ranks 20th among the EU-25 states and last but one among new Member States.

I.9 Response and participation of the EU-25 countries in the 6th thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

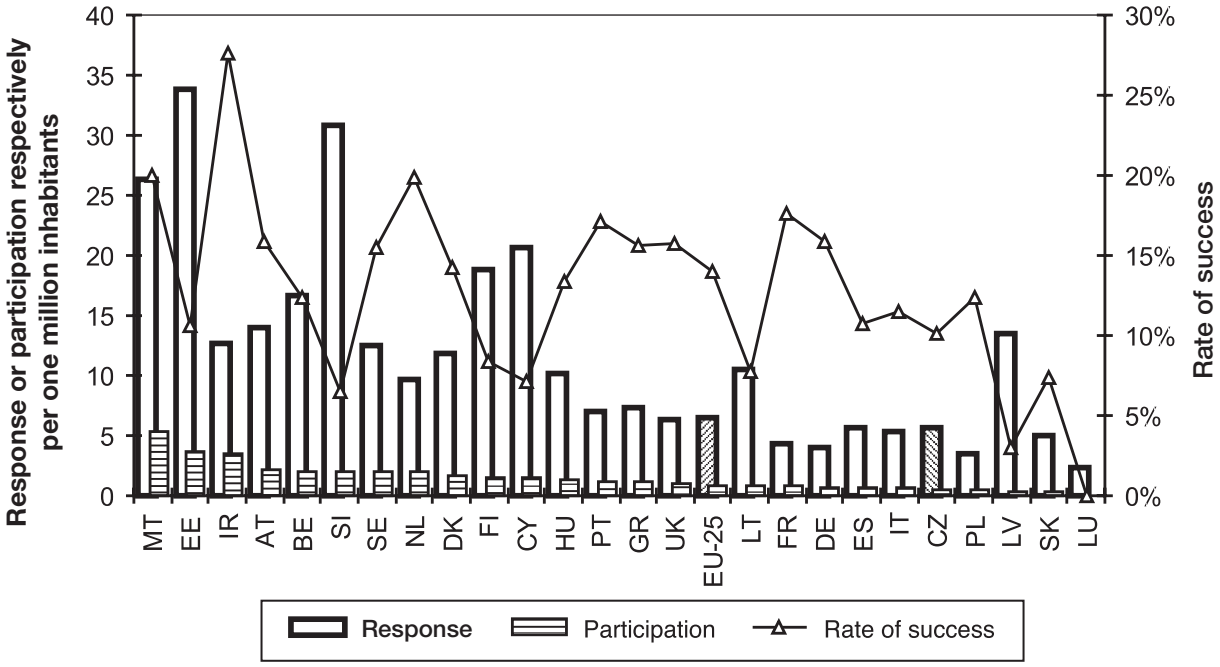
Commentary:

(1) The column graph I.9 depicts the response (columns without filling) and participation rates (columns with light grey filling) of the EU-25 states in the 6th thematic priority of 6FP "Sustainable development – global changes and ecosystems". The response rates of EU-25 and Czech Republic are dark grey. The curve displays the participation success of individual states. The states are arranged according to their descending participation.

(2) The highest response in this priority came from Malta (95), the Nordic states Denmark (75), Sweden (64) and Finland (59), and Cyprus (62). Unlike the Nordic states Malta and Cyprus had a very little rate of success. And so the above Nordic states have the highest participation in solution of 6FP projects.

(3) This is the only priority, in which the Czech Republic exceeded the average values of EU-25 both in response and participation. Values of these parameters rank the Czech Republic 14th (response) or 13th (participation) respectively among the EU-25 states. Out of all Member States, the Czech Republic had the highest rate of success. Everything testifies that in this thematic priority the Czech Republic has followed up with the excellent results attained by Czech teams in 5FP.

I.10 Response and participation of the EU-25 countries in the 7th thematic priority of 6FP



Source: Materials of SP1 programme committee "Concentrating and Integrating Community Research"

Commentary:

(1) The column graph I.10 depicts the response (columns without filling) and participation rates (columns with light grey filling) of the EU-25 states in the 7th thematic priority of 6FP "Citizens and governance in a knowledge-based society". The curve displays the participation success of individual states. The states are arranged according to their descending participation.

(2) It is evident from the graph that the highest response from all EU-25 states had Estonia, Slovenia, Malta and Cyprus. But the rate of success of Slovenia and Cyprus was very low which displaced them in participation to 6th or 11th place respectively among the EU-15 states. On the contrary, Malta had one of the highest rates of success and therefore its participation in solution of 6FP projects is the highest of all EU-25 states.

(3) By its response the Czech Republic ranks 19th and by participation 21st among the EU-25 states, or 7th among the new Members States respectively.

6th EU Framework Programme for Research and Development (2002–2006) and EURATOM programme

6th Framework Programme (6FP) follows up with the previous programmes by being again a programme of targeted research whose priorities are determined on the basis of an extensive discussion on the needs of EU. But the Sixth Framework Programme has a new general target – to contribute to the creation of the European Research Area – ERA. This target requires developing a joint policy of research and development supporting the attainment of the Lisbon strategy targets; to reach by 2010 the highest degree of competitiveness in the global knowledge-based society of the 21st century. Therefore the 6FP introduces absolutely new types of projects - integrated projects and excellence networks making possible the more effective connection of national teams into large research projects and networks necessary for solution of principal problems. In general, 6FP strives for better utilisation of capacities of the European research workplaces, better relationship of national researches and closer cooperation between research funded from public sources and private industrial research and creation of an environment supporting market application of research and development results.

EURATOM programme wishes to attain the above targets particularly in the field of peaceful use of nuclear energy.

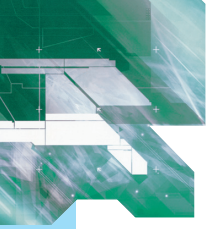
The summary budget of 6FP and EURATOM programme amounts to EUR 17.5 billion and its breakdown to individual priorities is given in Table A. Each priority has its own detailed working programme, which the European Commission (EC) calls for submission of draft projects refer to. Sixth Framework Programme was really launched on December 17, 2002 when first calls were delivered covering nearly the whole spectrum of its priorities.

The amount of the EC contribution to a team participating in the solution of any 6FP project depends on the type of its activity (and moves from 30 % of the overall cost with demonstration activities, 50 % with research activities and up to 100 % for project coordinators or investigators of projects, in which EC has a special interest).

Draft projects submitted mostly by international consortia go through a process of professional evaluation (peer review system), in the course of which an international team of experts classifies the project according to predetermined criteria. The draft projects have a chance to win the EC contribution in the ranking set by the above evaluation. The success of the project is to a great extent supported also by contracting negotiations between the investigating consortium and EC requiring the fulfilment of a whole range of formal requirements; the most important being the conclusion of a consortial contract between the participating teams (on the value of knowledge brought by each team at the beginning of a project, on the funds management in the course of the project solution and particularly on handling with the acquired results). Consortia for solution of 6FP projects can be formed without any limitations from teams of the EU-25 states, other associated countries (Bulgaria, Romania, Turkey, Island, Israel, Lichtenstein, Norway, and Switzerland) and the European international organisations. If required by the project solution, a team from any country may participate (with the amount of EC contribution on its participation regulated by special rules).

When evaluating the statistics on the participation of countries in 6FP it is necessary to bear in mind the factual reporting value of indicators provided by EC. On one hand, this is the aggregate number of teams of a particular country becoming members of consortia that responded to the EC calls for submission of draft projects within a certain programme. Because of comparability of a response the aggregate number of teams is converted to a unit population of 1 million inhabitants. The participation in the consortium itself does not reflect the importance of the team share in the draft project preparation. The significance of the participation can be to a certain extent assumed, e.g. from the share by which the team contributes to the overall project budget. Such information, however, are not available, because very often they have a confidential character. As far as the indicator of the participation success of a particular country in 6FP is concerned, it is necessary to consider that we place the success of a project, i.e. obtaining the European Commission contribution to the project solution, to the credit of teams of one country not taking in account that the success was participated also by other members of the consortium. The success is determined mostly by the team compiling the draft project from contributions of individual members of a consortium and if is satisfies demands put on a coordinator then it coordinates the project. With the above mentioned reserves the rates of response or success indicate the ability of teams to join the European projects of targeted research. This ability is, however, connected with the importance of the role given by the international environment to the teams of a particular country in a certain area of research and development. To this effect the relatively low participation of Czech teams in the first four thematic priorities of 6FP drawing more than 3/4 budget for all thematic priorities is alarming, while the participation of the Czech Republic in the 6th thematic priority covering three very important themes or in EURATOM programme can be regarded as success.

6th EU Framework Programme for Research and Development	EUR mil 16 270
1. Concentrating and Integrating Community Research	**13 345**
1.1 Thematic priorities:	11 285
1.1.1 Life sciences, genomics and biotechnology for health	2 255
1.1.1.1 Advanced genomics and its application for health	*1 100*
1.1.1.2 Combating major diseases	*1 155*
1.1.2 Information society technologies	3 625
1.1.3 Nanotechnologies and nanosciences, intelligent multifunctional materials, new production processes and devices	1 300
1.1.4 Aeronautics and space	1 075
1.1.5 Food quality and safety	685
1.1.6 Sustainable development, global changes and ecosystems	2 120
1.1.6.1 Sustainable energy systems	*810*
1.1.6.2 Sustainable surface transport	*610*
1.1.6.3 Global changes and ecosystems	*700*
1.1.7 Citizens and governance in a knowledge-based society	225
1.2 Cross-cutting research activities	1 300
1.2.1 Encouraging of policies and scientific and technological needs forecasting	555
1.2.2 Specific research activities supporting SMEs	430
1.2.3 Specific measures supporting international cooperation	315
1.3 Other than nuclear activities of Joint Research Centre	760
2. Structuring the ERA	**2 605**
2.1 Research and innovation	290
2.2 Human resources and mobility	1 580
2.3 Research and infrastructures	655
2.4 Science and society	80
3. Strengthening the Foundations of ERA	**320**
3.1 Co-ordination of research activities	270
3.2 Encouragement of coherent development of policies	50
Euratom Framework Programme	**1 230**
1. Priorities of research thematic activities	890
1.1 Controlled thermonuclear fusion	*750*
1.2 Management of radioactive waste	*90*
1.3 Radiation protection	*50*
2. Other activities in the field of nuclear technologies and safety	50
3. Joint Research Centre activities	290
In total	**17 500**



Comment: